SELECTED WATER RESOURCES ABSTRACTS

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WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Research and Technology, U.S. Department of the Interior

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As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, D. C. 20240

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For primary bibliographic entry see Field 2J.
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NONLINEAR KINEMATIC WAVE APPROXIMATION FOR WATER ROUTING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07935

PERCHED WATER TABLE FLUCTUATION COMPARED TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa.
W. E. Palkovics, G. W. Peterson, and R. P. Matelski.
Soil Science Society of America Proceedings, Vol 39, No 2, p 343-348, March-April 1975. 9 fig, 14 ref.

Descriptors: *Perched water, *Impervious soils, *Water level fluctuations, *Surface-groundwater relationships, *Water tables, *Groundwater recharge, Seasonal, Streamflow, Hydrographs, Groundwater movement, Recession curves, Soil moisture, Droughts, Saturation, Rainfall, Spring, Summer, Soil profiles, Evapotranspiration, *Pennsylvania, Freezing, Frost, Depth.
Identifiers: *Fragipan soils, *Freeze-thaw cycle.

Perched water table-streamflow relationships above a fragipan were studied on a forested watershed in the Valley and Ridge Province of central Pennsylvania. Automatic recording wells, a weir, and an automatic rain gage were installed to monitor perched water table changes, streamflow, and precipitation continuously. Time of year and precipitation were the most significant factors affecting perched water table and streamflow levels. In winter and early spring, streamflow and the perched water table were high and sensitive to rainfall and temperature changes. Rapid freezing and thawing affected water levesl within the recording wells and the stream. During late spring and summer, water loss due to evapotranspiration was the dominant factor in streamflow-perched water table responses. Diurnal fluctuations due to daily temperature variations were concurrently observed in both the stream and the perched water table. As the soil continued to dry in summer, streamflow ceased and water table response to rainfall declined. With heavy fall rains and low evapotranspiration, the perched water table reappeared and streamflow resumed. Increased streamflow and flooding due to large storms were greatest when the soil adjacent to the stream was saturated. (Schicht-ISWS)
W75-07946

AN INTERDISPLINARY APPROACH TO DEVELOPMENT OF WATERSHED SIMULATION MODELS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
C. Walters.
Journal of the Fisheries Research Board of Canada, Vol 32, No 1, p 177-195, January 1975. 6 fig, 3 tab, 1 ref.

Descriptors: *Simulation analysis, *Watershed management, *Multiple-purpose projects, Hydrologic systems, *Model studies, Fisheries, Fish management, Cost-benefit analysis, Forestry, Water quality, Recreation, Mathematical models, Sediment transport, Watersheds(Basins), Pacific Coast regions, *Canada.
Identifiers: Interdisciplinary studies, James Bay.

A workshop approach for the rapid development of simulation models was described. The key feature of the approach is intimate involvement of resource specialists in the model building process so that communication between resource disciplines is greatly enhanced. Two watershed models that have been developed ir. 1-week workshop meetings were described to show the kinds of factors that can be considered. One model is concerned with small coastal watersheds in the Pacific Northwest, and the other deals with part of the James Bay area, Quebec. Both of these models have helped scientists of Environment Canada identify major information needs that are not being considered in current research and management programs; in particular, little is known about the dynamics of recreational demand. (Terstriep-ISWS)
W75-07947

ESTIMATING LAND USE CHARACTERISTICS FOR HYDROLOGIC MODELS,
Rummel, Klepper and Kahl, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-07982

PRECIPITATION AND STREAMFLOW ON THREE SMALL CHILEAN WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
M. E. Jones, P. F. Ffolliott, and W. O. Rasmussen.
Progressive Agriculture in Arizona, Vol 27, No 1, p 13-16, January-February, 1975. 4 fig.

Descriptors: *Precipitation(Atmospheric), *Streamflow, *Small watersheds, *Vegetation effects, *Hydrologic data, Runoff, Sediment yeild, Water quality, Peak discharge, Land use, Rainfall, Storms, Hydrographs, Stream gauges.
Identifiers: *Chile.

Preliminary results of a small watershed project initiated by Chile's Ministry of Agriculture in 1970 are presented. Information gathered on precipitation and streamflow for single land-use and vegetation types may be used for evaluating design methods for small dams, recommending land-use procedures, and describing hydrologic events. The three watersheds instrumented and measured for this study are part of a more extensive small basin network covering diverse climatic, vegetation, and land-use conditions in Chile. Some results of this preliminary study in areas relatively unaffected by drastic vegetation manipulation indicated high water quality in terms of sediments, and low annual runoff efficiency. Peak runoff and sediment loads were more sensitive to climatic and treatment changes. Peak flow values correlated better with total storm rainfall than did flow volumes. Peak flows were as much as 90 percent higher from burned watersheds. A longer data record eventually will better define relationships between precipitation and streamflow in Chile. (Mastic-Arizona)
W75-08104

HYDROLOGIC SIMULATION OF WATERSHEDS WITH ARTIFICIAL DRAINAGE,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
K. L. Campbell, and H. P. Johnson.
Water Resources Research, Vol 11, No 1, p 120-126, February 1975. 9 fig, 1 tab, 18 ref. OWRR R-025-IA(3).

Descriptors: Hydrology, *Surface-groundwater relationships, *Soil water movement, Soil-water-plant relationships, *Simulation analysis, Subsurface drains, Mathematical models, Model studies, Evapotranspiration, Routing, Soil moisture, *Iowa, Tile drainage, Tile drains, Watersheds(Basins), *Watershed management.
Identifiers: *Artificial drainage, *Drainage simulation, Jefferson(Ia).

A deterministic hydrologic watershed model that simulates the watershed discharge and soil moisture status continuously throughout the crop season was developed for drainage watersheds with depressional storage. The model simulates the processes of interception, surface storage, infiltration, surface runoff, soil profile storage, percolation to the water table, subsurface tile drainage, soil moisture redistribution, evapotranspiration, and routing through depressions, tile mains, and the drainage ditch. The resulting outputs are daily evapotranspiration, soil moisture status in the crop root zone, and watershed discharge. The model was successfully tested on a 24-sq mi watershed near Jefferson, Iowa. (Terstriep-ISWS)
W75-08191

TEMPERATURE EFFECTS ON GREAT LAKES WATER BALANCE STUDIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 2H.
W75-08225

ARIDITY PROBLEMS IN THE SAHEL, TWENTY YEARS OF UNESCO ACTIVITY.
Nature and Resources, Vol 10, No 1, p 8-11, January-March, 1974.

Descriptors: *Africa, *Arid lands, *Arid climates, *Climatology, *Comprehensive planning, *Data collections, *Land use, *Natural resources,

*Research and development, *United Nations, Alternative planning, Cultures, Economics, Ecosystems, Environment, Grazing, Land management, Livestock, Maps, Population, Resources development, Social aspects, Water supply.
Identifiers: *Sahelian zone.

Climatological causes of cyclical droughts, such as that devastating the Sahel in 1972-73, are still unknown, though in 1951 UNESCO set up an Advisory Committee for Arid Zone Research to study droughts in affected regions of Africa and the Mediterranean. A major interdisciplinlary project evolving from the Committee's work resulted in some 30 arid-zone study publications. Several maps on these arid regions, prepared with other international agencies, have been issued since 1962. During the last 20 years considerable data on the natural environment have been accumulated, and field studies of the affected zones have been made. Currently, multidisciplinary UNESCO activity oriented to these arid zones involves Man and the Biosphere Program and the International Hydrological Program. Through cooperation with officials in afflicted countries future UNESCO activities probably will involve emphasis on applied research with alternative life-support systems appropriate to the environment, culture, and economy. A thorough understanding of the complex interactions of this fragile ecosystem is necessary before imported technological modification of traditional land use can be instituted. Under fluctuating, marginal, climatic conditions, and given the disruptions of the drought years in this particular socio-economic-cultural context, management of the vast Saharo-Sahelian grazing lands must be extended also to the Sudano-Sahelian area, where the migratory influx of humans and livestock has affected agriculture and sedentary activities generally, as well as crop production, grazing, and water supply. UNESCO international research programs, thus, can make a significant contribution to the Sahelian drought situation. (Gloyd-Arizona)
W75-08282

CLIMATOLOGICAL WATER BUDGET AND WATER AVAILABILITY PERIODS OF IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W75-08283

THE ANCIENT NAMIB DESERT,
E. S. Ross.
Pacific Discovery, Vol 25, No 4, p 2-13, July-August, 1972. 22 fig.

Descriptors: *Biota, *Desert plants, *Deserts, *Ecotypes, *Fog, *Xerophilic animals, Arid climates, Arid lands, Diurnal, Nocturnal, Seasonal, Temperature, Winds.
Identifiers: *Namid Desert, *South Africa, Kuiseb River, Kokerboom, Welwitschia.

Perhaps as old as the continent itself, dating from the end of the Jurassic period, the Namid Desert in southern Africa commands considerable biological interest. At Gobabeb, geographically centered astride the desert's 3 main biotypes, is the Namid Desert Research Station, the seat of the Desert Ecological Research Unit, Republic of South Africa. To the north lie extensive gravel rock plains and a thin strip of riverine forest watered by the underground flow of the Kuiseb River; to the south, vast red sand dunes. The Namid's rich biota is sustained by moisture from fog banks formed off Africa's southwestern shores and carried inland 30-40 mi by brisk west winds. Sea fog is heaviest on early winter mornings: maximum dampness occurs then, for the Namid has no regular rainy season. Plants include lichens, stone succulents, a strange gymnosperm-Welwitschia, cactus-like euphorbias and milkweeds, a tree aloe--the kokerboom, and several unique forms of the grape family. During the day only insects are in evidence, mostly beetles and wasps. Nocturnal dune animals include tenebrionids, scarabs, spiders, skinks, Palmatogeckoes, sand vipers, owls, moles, and gerbils, which avoiding hot sun and desiccating winds, appear at night to feed and mate. Studies of diurnal insects here revealed temperature adaptation is accomplished by moving from place to place in the thermal mosaic of sand, rock, and vegetation. (Gloyd-Arizona)
W75-08288

2B. Precipitation

FREQUENCY ANALYSIS OF RAINFALL INTENSITIES FOR NAGPUR (SONEGAON),
College of Agriculture, Junagadh (India).
A. I. Patel, and S. S. Vanjari.
P K V Res J, Vol 1, No 1, p 15-19, 1972.
Identifiers: *Frequency analysis, *India(Nagpur), *Rainfall intensity, Climatic data.

Autographic rainfall records of Nagpur (Sonegaon Airport), India, were analysed with a view to developing rainfall intensity duration frequency curves. For this purpose a frequency analysis of rainfall data over a period of 20 yr from 1948-1967 was carried out using Gumbels technique.-- Copyright 1973, Biological Abstracts, Inc.
W75-08000

BIOGENIC AND INORGANIC SOURCES FOR ICE NUCLEI IN THE DROUGHT-STRICKEN AREAS OF THE SAHEL--1974,
National Center for Atmospheric Research, Boulder, Colo.
R. C. Schnell.
Interim Report to the Directors, Rockefeller Foundation, New York, New York, December 1974. 18 p, 8 fig, 20 ref.

Descriptors: *Rainfall, *Africa, *Meteorology, *Weather modification, *Droughts, *Arid lands, Artificial precipitation, Cloud seeding, Water shortage, Environmental effects, Carrying capacity, Grazing.
Identifiers: *Sahel, Ice nuclei, Overgrazing.

Recent research has shown that organic decay products of tree and grass litters (i.e. biogenic nuclei) may act as atmospheric ice nuclei at relatively warm temperatures (-2 to -10 degrees C). Theory has suggested a sensitive relationship between the availability of such ice-forming nuclei and the amount of precipitation. A hypothesis is advanced that massive overgrazing in the sub-Saharan (Sahel) region of Africa which preceded the recent drought, resulted in depletion of the sources of these biogenic nuclei and a subsequent reduction in total precipitation. The hypothesis was tested by sampling the availability of surface-derived ice nuclei in the Sahel. The results show that where organic decay products were available, ice forming nuclei active at -7 degrees C were present in concentrations to 10,000 per gram. Soils relatively free of such organic decay products were found to contain no ice forming nuclei active at temperatures warmer than -14 degrees C and only 1000 per gram of material active at -18 degrees C. It is suggested that poor agricultural management contributed to the persistence and severity of the drought, and a feedback mechanism between the vegetation and local precipitation is proposed. (Bowden-Arizona)
W75-08115

ARIDITY PROBLEMS IN THE SAHEL, TWENTY YEARS OF UNESCO ACTIVITY.
For primary bibliographic entry see Field 2A.
W75-08282

CLIMATOLOGICAL WATER BUDGET AND WATER AVAILABILITY PERIODS OF IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
M. S. Kettaneh, and M. Gangopadhyaya.
Institute for Applied Research on Natural Resources, Baghdad, Iraq. Technical Bulletin 65. July 1974. 4 fig, 2 tab, 6 ref.

Descriptors: *Hydrologic budget, *Water allocation(Policy), *Evapotranspiration, *Meteorological data, *Water zoning, *Soil moisture, *Water storage, *Agroclimatology.
Identifiers: *Iraq.

A water budget for Iraq was obtained using mean monthly rainfall and potential evapotranspiration. Soil moisture storage was also accounted for in deriving the water budget. Water availability periods were defined as humid, moist, moderately dry to dry, and very dry based on defined rainfall-potential evapotranspiration relationships. The four categories of water availability were determined for the weather stations throughout Iraq, and categories mapped to show the geographical distribution of these agroclimatic factors in Iraq. A proposal for agroclimatic zoning of the country based on these studied is being considered. (Mastic-Arizona)
W75-08283

VARIABILITY AND PROBABILITY CHARACTERISTICS OF ANNUAL RAINFALL OF IRAQ,
Institute for Applied Research on Nutural Resources, Baghdad (Iraq).
M. S. Kettaneh, M. Gangopadhyaya, and G. F. Kaka.
Institute for Applied Research on Natural Resources, Baghdad, Iraq. Technical Bulletin No 68, August 1974. 11 p, 3 fig, 2 tab, 9 ref.

Descriptors: *Rainfall, *Climatic data, *Probability, *Variability, *Isohyets, Irrigation, Agriculture.
Identifiers: *Iraq.

Data gathered from a small network of weather stations manned by the Iraq Meteorological Department were used to compile an isohyetal map of mean annual rainfall. The derivation of probability and variability factors for rainfall are important for the planning of national development activities, particularly in agriculture and irrigation. Data limited the derivation of variability and probability levels to an annual basis. Factors from the variability study show maximum and minimum rainfall, mean, median, standard deviation, coefficient of variability, sequential variability, and relative variability. Probabilities cannot be interpreted as periodicities, they only indicate an average chance of rainfall occurrence on a long-term basis. (Mastic-Arizona)
W75-08284

2C. Snow, Ice, and Frost

MACLURE GLACIER, CALIFORNIA,
Geological Survey, Sacramento, Calif.
W. W. Dean.
In: Proceedings of the Western Snow Conference, 42nd Annual Meeting, April 16-20, 1974, Anchorage, Alaska: Printed by Colorado State University, Fort Collins, p 1-8, 1974. 4 fig, 1 tab, 8 ref.

Descriptors: *Glaciers, *Glaciohydrology, *California, *Water balance, Meteorological data, Basic data collections, Hydrologic budget, Regimen.
Identifiers: *Maclure Glacier(Calif).

Maclure Glacier and other small glaciers in the Sierra Nevada of California survive in the present climatic regime because of favorable high-altitude topography and mean annual precipitation that

equals ablation on the average. The precipitation is amplified by prevailing southwest storm winds that drift snow into the steep-walled north-facing amphitheaters in which the glaciers exist. The 6 years of available data show that the present glacier mass is sensitive to changes in annual precipitation. An average depth of 1.2 m of water equivalent was added to the glacier in the heavy snow year of 1967 and 0.7 m in 1969. Precipitation both years was much above average. The 1968 and 1972 years had below-average precipitation and an average depth loss of 0.8 m of water equivalent from the glacier each year. Annual runoff from the Maclure Creek basin fluctuated much less than annual precipitation. The basin accumulated 2.0 m of snow-water equivalent in 1967 but only 0.6 m in 1968. Yet, total runoff depth was 1.5 m in 1967 when an average of 0.4 m of water was stored over the basin, and 0.9 m in 1968 because of the melting of 0.3 m of old ice and firn over the basin. The small Sierra Nevada glaciers provide natural cyclic water storage that smooths fluctuation in precipitation. Practically all runoff from the Maclure Glacier basin occurs during the June-September period when it is beneficial in sustaining downstream flow. (Knapp-USGS)
W75-07868

SOUGH CASCADE GLACIER: THE MODERATING EFFECT OF GLACIERS ON RUNOFF,
Geological Survey, Tacoma, Wash.
R. M. Krimmel, and W. V. Tangborn.
In: Proceedings of the Western Snow Conference, 42nd Annual Meeting, April 16-20, 1974, Anchorage, Alaska: Printed by Colorado State University, Fort Collins, p 9-13, 1974. 3 fig, 5 ref.

Descriptors: *Glaciers, *Glaciohydrology, *Melting, Runoff, Streamflow, *Washington, Snowmelt, Water balance, Regimen.
Identifiers: *South Cascade Glacier(Wash).

The presence of only a few small glaciers in a large drainage basin has a substantial effect on the variance of summer streamflow. This is an important factor when making streamflow forecasts, particularly during periods of low precipitation. During years of greater than normal precipitation, when nonglacier areas have high runoff, the greater snowfall occurring on glaciers retards ablation. The reverse is true during years of low precipitation and less snow accumulation. The earlier exposure of ice to radiation will cause greater glacier melt, thus compensating for the diminished streamflow from other sources. In years of high snow accumulation, a greater than average amount of avalanching and drifting occurs from the steeper slopes surrounding glaciers, producing an even greater protective blanket over the low albedo ice. The release of liquid storage from within the glacier aquifer each summer will also tend to moderate glacier runoff because this storage and release mechanism is nearly independent of any external climatic variations. Results of the South Cascade Glacier IHD program from 1965-73 can be used to exemplify these effects. (Knapp-USGS)
W75-07869

PERCHED WATER TABLE FLUCTUATION COMPARED TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa.
For primary bibliographic entry see Field 2A.
W75-07946

ICE-RAFTED SEDIMENTS AS A CAUSE OF SOME THERMOKARST LAKES IN THE NOATAK RIVER DELTA, ALASKA,
Washington Univ., Seattle. Coll. of Forest Resources.
F. C. Ugolini.
Science, Vol 188, No 4183, p 51-53, April 4, 1975. 3 fig, 5 ref.

Descriptors: *Ice, *Lakes, *Deltas, Geomorphology, Ponds, Rivers, Sediments, Arctic, Cold regions, Thawing, Frozen soils, Melting, On-site investigations, *Alaska.
Identifiers: *Thermokarst, Lake forming processes, Noatak River Delta(Alas).

Irregular, barren polygonal sheets of mud scattered over the landscape of the western portion of the Noatak River Delta are derived from lake-bottom sediments, ice-rafted during flooding. The evidence suggests that the sheets of mud change the albedo and the thermal regime of the soil, induce the development of thermokarst, and lead to the formation of ponds and lakes. The angular perimeters, especially of the small ponds, support the suggested mode of formation. (Sims-ISWS)
W75-07948

A PATTERN OF HUMUS HORIZON IN TUNDRA'S LOAMY SOILS IN THE NORTHEASTERN EUROPEAN TUNDRA,
I. B. Archegova.
Ekologiya, Vol 3, No 5 p 64-67, 1972.
Identifiers: *Cryogenic-coagulative genesis, Freezing, *Humus, *Loamy soils, Soils, Thawing, *Tundra loamy soil, Tundras, *Water temperature, Soil freezing, Soil thawing, Europe.

Characteristics of humus forming conditions in tundra loamy soils are described. The most important is the water-tempe rature regime characteristic of the tundra: long freezing of the soil and slow thawing. The humus horizon has a specific cryogenic-coagulative genesis.--Copyright 1973, Biological Abstracts, Inc.
W75-07969

NAVIGATION SEASON EXTENSION DEMONSTRATION PROGRAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W75-08044

HUNGRY HORSE CLOUD SEEDING PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 3B.
W75-08059

SOME EFFECTS OF EXTENDING THE NAVIGATIONAL SEASON ON THE GREAT LAKES: A NEED FOR CONGRESSIONAL ACTION,
Cleveland State Univ., Ohio. Coll. of Law.
For primary bibliographic entry see Field 6E.
W75-08072

SPECIAL FLOOD HAZARD REPORT: CHESTER CREEK, GREATER ANCHORAGE AREA,
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-08173

A TECHNIQUE TO EVALUATE SNOWPACK PROFILES IN AND ADJACENT TO FOREST OPENINGS,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, and D. B. Thorud.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol 4, Proceedings of the 1974 meetings of the AWRA, Arizona Section and the AAS, Hydrology Section, Flagstaff, Arizona, p 10-17. 2 fig, 10 ref. OWRR A-029-ARIZ(7). 14-31-0001-3503.

Descriptors: *Snowpacks, *Arizona, *Vegetation effects, *Ponderosa pine trees, *Snow management, Snow, Canopy, Forests, Evaluation, Estimating, Water equivalent, Water yield.
Identifiers: Strip cutting, Forest openings, Snow accumulation.

Profiles of snowpack build-up in openings in forest overstories have been widely observed; however, a quantitative characterization of such a snowpack profile would aid in developing empirical guidelines for improving water yields from snowpacks. A technique is outlined that illustrates (a) evaluating snowpack profiles in and adjacent to individual forest openings in terms of increase or decrease in water equivalent, and (b) defining trade-offs between the estimated increase or decrease in snowpack water equivalent and the forest resource removed. Snowpack water equivalent during peak seasonal accumulation was measured in and adjacent to a clearcut strip in a ponderosa pine stand in north-central Arizona. A 4-degree polynomial, which defines the snowpack profile in terms of deposition, redistribution, and ablation characteristics, was empirically selected to describe snowpack water equivalent data points. An increase of 60 percent in snowpack water equivalent was realized by removing 46 percent of the ponderosa pine in the zone of influence, using a strip equal to one and one-half the height of the adjacent overstory. (White-Arizona)
W75-08221

DEVELOPMENT OF FOREST MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
P. F. Ffolliott, and D. B. Thorud.
Arizona Water Resources Project Information, Project Bulletin No. 7, 4 p, December 1974. 1 fig. OWRR A-045-ARIZ(1). 14-31-001-5003.

Descriptors: *Snowmelt, *Snowpacks, *Water yield improvement, *Forest management, *Forecasting, *Arizona, Timing, Forests, Clearcutting, Snow management, Vegetation effects, Canopy, Interception, Snowfall, Watershed management, Runoff, Environmental effects, Geomorphology, Equations, Runoff forecasting.
Identifiers: *Salt-Verde River Basin(Ariz), Snowpack dynamics, Runoff efficiency.

Research is underway to develop operational forest management guidelines for increasing water yields from snowpacks on the Salt-Verde River Basin. Water yield improvement experiments have demonstrated that increased snowmelt runoff may result from a reduction or removal of forest overstories; however, the hydrologic mechanisms involved have not been completely identified and quantified. The investigation framework as designated by a PERT analysis has set up the required activities of the project. Steps include formulation of three inventory reports (for physiographic, climatic, and vegetation characteristics), establishment of test sites to represent these hydrologically significant features, and implementation of studies to evaluate forest overstory characteristics and the effects on snowpack dynamics. Some studies have been conducted on the snow regime as affected by different density levels and clearing patterns in the forest overstory, which has led to a time-space analytic technique to describe snowpack profiles in and adjacent to openings. Assessments of physiographic and climatic factors affecting the magnitude of snowmelt runoff have also begun. Preliminary results indicate that, although runoff efficiencies for a watershed may be unique for each year, a pattern of relatively low efficiencies at the beginning and end of runoff with relatively high efficiencies between 40 and 60 percent snowpack ablation exists. (White-Arizona)
W75-08222

2D. Evaporation and Transpiration

A SINGLE-BEAM INFRARED HYGROMETER FOR EVAPORATION MEASUREMENT,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
P. Hyson, and B. B. Hicks.
Journal of Applied Meteorology, Vol 14, No 3, p 301-307, April 1975. 8 fig, 6 ref, 1 append.

Descriptors: *Evaporation, *Hygrometry, Infrared radiation, Instrumentation, Humidity, Eddies, Adsorption, Latent heat, Optical properties, Electronic equipment, Measurement, Remote sensing.
Identifiers: *Infrared hygrometer, Eddy correlation.

Two instruments were described which serve as humidity sensors in conjunction with existing eddy correlation techniques. The first instrument is an infrared absorption device, with a 40 cm path length, operating in a water vapor vibrational band at 6.3 micrometers. The second instrument is a development of this, operating at 2.7 micrometers with a 20 cm path length. Both devices were successfully field tested in a latent heat flux format, with a propeller anemometer as a vertical velocity sensor. Satisfactory energy balances at the surface were obtained. In the case of the 2.7 micrometer instrument, a specific advantage was its lack of sensitivity to ambient humidity levels, while both instruments were insensitive to slow variations of optical and electronic performance. (Roberts-ISWS)
W75-07901

THE MEASUREMENT OF WATER CONTENT BY AN EVAPORATOR,
National Center for Atmospheric Research, Boulder, Colo.
T. G. Kyle.
Journal of Applied Meteorology, Vol 14, No 3, p 327-332, April 1975. 4 fig, 14 ref.

Descriptors: *Ultraviolet radiation, *Clouds, *Evaporation, *Instrumentation, *Evaporators, Supercooling, Humidity, Condensation, Radar, Convection, Storms, Electronic equipment, Absorption, Moisture content, Measurement.
Identifiers: Radar reflectivity.

An instrument for measuring the condensed water content in supercooled clouds was described. The instrument operated by evaporating water and then measuring the specific humidity by ultraviolet absorption. Among the characteristics required of the instrument was the ability to operate in severe icing conditions; a response independent of the particle size, whether liquid or frozen; and the ability to measure water contents as great as 40 g/cu m. These requirements were established because the measurements were carried out inside the high radar reflectivity region of convective storms where few previous measurements had been carried out. In operation, the air and water the instrument contained flowed into a forward aperture at a rate approximately equal to the aircraft velocity, were heated, and the water evaporated. Large water drops were broken up into smaller droplets which could be more quickly evaporated and the surfaces which the water struck were not at such a high temperature as to prevent the wetting of the surface. The intake aperture was 0.8 cm in diameter, and the response time approximately 1 s. It was shown that the variance of the total water content could be used to derive the radar reflectivity with no knowledge of the drop size spectrum. Examples of data obtained inside mature convective storms were shown. (Roberts-ISWS)
W75-07902

MORPHOMETRIC CONTROL OF VARIATION IN ANNUAL HEAT BUDGETS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W75-07950

WINTER-REGIME SURFACE HEAT LOSS FROM HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-07990

THE EFFECT OF STABILITY ON EVAPORATION RATES MEASURED BY THE ENERGY BALANCE METHOD,
Macquarie Univ., North Ryde (Australia). School of Earth Science.
A. P. Campbell.
Agric Meteorol, Vol 11, No 2, p 261-267, 1973, Illus.
Identifiers: Bowen ratio, *Energy balance method, *Evaporation rates, Heat, Measurement, Stability conditions, Water vapor, Methodology, Diffusion.

Comparative lysimetric and energy balance data is examined in relation to stability conditions. Some recently published experimental relations between the eddy diffusivities for momentum, heat and water vapor are then used to determine the effect of the assumption of equal diffusivities on the calculation of the Bowen ratio. These effects are shown to support the comparative measurements.--Copyright 1973, Biological Abstracts, Inc.
W75-08088

RADIATION INDUCED THERMAL STRATIFICATION IN SURFACE LAYERS OF STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W75-08098

UTILIZING CLIMATE-MOISTURE-WATER USE RELATIONSHIPS IN IMPROVING SOIL MOISTURE BUDGET METHOD FOR IRRIGATION SCHEDULING,
Punjabrao Krishi Vidyapeeth, Akola (India). Dept. of Agronomy.
B. G. Bathkal, and N. F. Dastane.
P K V Res J, Vol 1, No 1, p 70-76, 1972.
Identifiers: Climates, Fodder, *Irrigation scheduling, *Soil moisture, Sorghum, Transpiration, *Water utilization, Evapotranspiration.

Two field trials were conducted. The 1st trial was aimed at working out the relationship between soil moisture and actual water use rates (ET) as well as relative evapotranspiration rates (ET/EO) of fodder sorghum under different evaporative conditions. These relationships were utilized in the next trial for predicting irrigation schedules on the same crop for 3 soil moisture regimes viz. wet regime (l sub 1), medium wet regime (l sub 2) and dry regime (l sub 3) with 100-75%, 100-50%, and 100-25%, available soil moisture, respectively, within 0-90 cm soil depth. ET was directly related to soil moisture conditions and evaporative demand of climate, while ET/EO was positively related to the available soil moisture but negatively related with EO conditions. The relationship curves gave a perfect prediction of irrigation schedules under wet and medium wet regimes, while in dry regime, predicted irrigation dates varied from the actual one by 2-3 days only. Thus, the soil-2 moisture budget method is made precise if the relationship between soil moisture and ET as well as ET/EO are worked out under different evaporative conditions.--Copyright 1973, Biological Abstracts, Inc.
W75-08275

CLIMATOLOGICAL WATER BUDGET AND WATER AVAILABILITY PERIODS OF IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 2B.
W75-08283

2E. Streamflow and Runoff

HYDROGEOLOGIC AND WATER-QUALITY DATA IN WESTERN JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2F.
W75-07862

THE BIG CYPRESS SWAMP,
Geological Survey, Miami, Fla.
For primary bibliographic entry see Field 2L.
W75-07863

ANALYSIS OF ERTS-RELAYED WATER-RESOURCES DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-07871

HYDROLOGIC DATA NEEDS FOR SMALL WATERSHEDS--STREAMFLOW AND RELATED PRECIPITATION DATA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-07874

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 1. SURFACE WATER RECORDS.
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W75-07879

HARMONIC ANALYSIS OF STREAM TEMPERATURES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07882

ONE-DIMENSIONAL STREAM EXCESS TEMPERATURE ANALYSIS,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5B.
W75-07883

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, 1975.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 7C.
W75-07886

STATISTICS OF SURFACE LAYER TURBULENCE OVER THE TROPICAL OCEAN,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. Leavitt, and C. A. Paulson.
Journal of Physical Oceanography, Vol 5, No 1, p 143-156, January 1975. 18 fig, 6 tab, 28 ref, 1 append. NSF Grants GA-4091, GA-1099.

Descriptors: *Turbulence, *Winds, *Temperature, *Humidity, Tropic, Oceans, Atmosphere, Variability, Data collections, Data processing, Meteorology, Statistics, Kinetics, Energy.
Identifiers: Flip, Variances, Fluxes.

Atmospheric surface layer turbulent statistics measured during the Barbados Oceanographic and Meteorological Experiment 8 and 30 m above

mean sea level were presented. The budget equations of turbulent kinetic energy, humidity variance, and temperature variance were examined. Within discussed limitations, it was concluded that production equals dissipation in the case of turbulent kinetic energy and humidity variance. The analysis of the temperature variance budget revealed large differences between productions and dissipations computed assuming standard similarity functions derived from other data sets. Initial computation of fluxes revealed large systematic decreases with height in the shear stress and heat flux. Comparison with other results suggested corrections which would eliminate these differences. Comparison between profile fluxes and direct measurements suggested strong similarity of momentum and water vapor transfer. (Sims-ISWS)
W75-07909

SPECTRAL CHARACTERISTICS OF SURFACE LAYER TURBULENCE OVER THE TROPICAL OCEAN.
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. Leavitt.
Journal of Physical Oceanography, Vol 5, No 1, p 157-163, January 1975. 11 fig, 1 tab, 21 ref. NSF Grants GA-4091, GA-1099.

Descriptors: *Turbulence, *Winds, *Temperature, *Humidity, Atmosphere, Boundary layers, Oceans, Tropic, Wind velocity, Variability, Meteorology, Data processing.
Identifiers: *Spectra.

Spectra of wind, temperature, and humidity fluctuations measured during BOMEX in the atmospheric surface layer were discussed. Strong similarities exist between dimensionless humidity and horizontal wind velocity spectra and between dimensionless cospectra of the water vapor flux and the momentum flux. In contrast, the peaks of the temperature spectra and the sensible heat flux cospectra occur at frequencies an order of magnitude greater than those of the other two variables. These differences are related to the mean vertical planetary boundary layer profiles of the three variables as well as to the effects of heating-cooling by divergence of radiation in the planetary boundary layer. (Sims-ISWS)
W75-07910

ROTARY CROSS-BISPECTRA AND ENERGY TRANSFER FUNCTIONS BETWEEN NON-GAUSSIAN VECTOR PROCESSES I. DEVELOPMENT AND EXAMPLE,
Oregon State Univ., Corvallis. School of Oceanography.
N-C. Yao, S. Neshyba, and H. Crew.
Journal of Physical Oceanography, Vol 5, No 1, p 164-172, January 1975. 4 fig, 1 tab, 12 ref. ONR Contract N00014-68-A-0148; NSF Grants GA-23015, GA-1589.

Descriptors: *Statistical methods, *Mathematical studies, *Oceanography, Ocean currents, Energy transfer, Methodology, Statistics, Data processing.
Identifiers: *Rotary cross-bispectra, Vector processes, Cross-bispectrum analysis.

Bispectrum and cross-bispectrum analyses of the rotary components of stationary random vector processes are more easily interpreted than similar analyses of their scalar components, and have the advantage that the bispectral estimates are invariant to coordinate rotation. Application to some wind-ocean current data showed these to be non-Gaussian and subject to significant nonlinear coupling over a wide range of interacting triplets of rotary components. A set of complex-valued energy transfer functions were developed by which the magnitudes of the linear and quadratic interactions may be compared. (Sims-ISWS)
W75-07911

A NOTE ON OBSERVATIONS OF LONG-TERM TRAJECTORIES OF THE NORTH PACIFIC CURRENT,
Texas A and M Univ., College Station. Dept. of Oceanography.
A. D. Kirwan, Jr., and G. McNally.
Journal of Physical Oceanography, Vol 5, No 1, p 188-191, January 1975. 4 fig, 7 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Pacific Ocean, Tracking techniques, Currents(Water), Oceanography, Oceans.
Identifiers: *Drifter studies, North Pacific current.

Two long-term drifters were tracked for several months in the North Pacific as part of the NORPAX Pole experiment. The trajectories indicate at least one core of the North Pacific current was centered around 37N. Velocities of the drifters indicate that the current is highly variable with eastward components ranging from 0 to over 20 cm/s. After the first two weeks there was virtually no north-south movement. An analysis of the drifter separation showed that for two weeks the drifters moved together. Thereafter, the separation rate was approximately exponential. The separation was due to the eastward movement of one drifter with respect to the other. (Sims-ISWS)
W75-07913

HORIZONTAL SCALES IN THE MAIN THERMOCLINE DERIVED FROM THE TOPOGRAPHY OF A CONSTANT SOUND SPEED SURFACE BETWEEN BERMUDA AND THE ANTILLES,
Woods Hole Oceanographic Institution, Mass.
J. C. Beckerle, and J. B. Hersey.
Journal of Geophysical Research, Vol 80, No 6, p 849-855, February 20, 1975. 6 fig, 1 tab, 18 ref.

Descriptors: *Oceans, *Thermocline, *Sound waves, *Atlantic Ocean, Physical properties, On-site investigations, Spatial distribution, Temporal distribution, Temperature, Internal waves, Oceanography, Topography.
Identifiers: Rossby waves, Baroclinic waves.

Broad scale horizontal variations of the main thermocline south of Bermuda were revealed by an extensive ocean measurement program over several years. The primary physical property of the ocean sampled during these studies was the sound speed because of interest in underwater sound propagation. For the oceanographer the sound speed measurements in the main thermocline provide information similar to ocean temperature measurements except that there is also a dependence of the sound speed on the salinity and the pressure. In the summer of 1962, 31 sound speed profiles were measured. This measurement was followed in the summer of 1964 with 67 sound speed profiles. Complex horizontal variations of a surface of constant sound speed found near the depth of 800 m were the beginning indications of spatial scales of about 240 + or -60 miles of undulations in the main thermocline. In the summer of 1966, 115 sound speed profiles were measured, most of which were distributed on a rhombic grid pattern with 65 miles between stations. These observations were compared with the 1962 and 1964 measurements. The 1966 measurements confirmed the existence of a spatial scale of about 240 miles (+ or -60 miles) as well as the existence of other scales in this ocean region. The spatial variations were indicated by a contour pattern of the depth variations (approximately 300 m) of a 1502-m/s sound speed surface near the depth of 800 m in the main thermocline, where the vertical thermal gradient is large. The observations were interpreted as evidence for Rossby waves or baroclinic waves possibly of finite amplitude that show northwest-southeast alignment. (Sims-ISWS)
W75-07919

OBSERVATIONS OF OCEANIC INTERNAL AND SURFACE WAVES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 7B.
W75-07920

OBSERVATION AND INTERPRETATION OF A HIGH-FREQUENCY INTERNAL WAVE PACKET AND SURFACE SLICK PATTERN,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
T. B. Curtin, and C. N. K. Mooers.
Journal of Geophysical Research, Vol 80, No 6, p 882-894, February 20, 1975. 15 fig, 3 tab, 14 ref. NSF Grant GX-33052.

Descriptors: *Internal waves, Oceans, Continental shelf, Acoustics, Sounding, On-site investigations, Oceanography, Temperature, Chlorophyll, *Oregon, *Pacific Ocean, *Ocean waves.
Identifiers: *Surface slicks.

A packet of high-frequency (period approximately 8 min) internal gravity waves was observed on a precision depth recorder (PDR) chart while an anchor stations was being conducted during the Cue 1 experiment off Oregon. The anchor station was located over the continental shelf and in the frontal zone associated with coastal upwelling. The packet appeared as a set of three oscillations (maximum peak-to-peak amplitude of 11 m) of an acoustic scattering layer located at a depth of about 20 m, which was immediately below the center of the permanent pycnocline (25.5-26.0 sigma t) at that time and location (water depth 80 m, 10-km offshore). The scattering layer occurred at the depth of a chlorophyll A maximum; strong temperature, salinity, and sound speed gradients; and strong vertical shear of the horizontal velocity. Simultaneously, a series of surface slicks, oriented parallel to the isobaths and propagating onshore, was observed under conditions of light winds. From the spacing of the slicks a horizontal scale of 100 m was estimated; this scale corresponded closely to the wavelength of the first internal wave mode for the observed wave period. From time series of nearby moored current and temperature sensors, bursts of high-frequency oscillations were noted on semidiurnal tidal cycles. Such bursts occurred a few hours before the internal wave packet was observed on the PDR. It was concluded that the semidiurnal baroclinic tide breaks down in the frontal zone off Oregon, forming large-amplitude high-frequency internal gravity waves. These waves can induce detectable surface slicks under light wind conditions and major perturbations of a shallow scattering layer when it is present. (Sims-ISWS)
W75-07921

COMPUTATION OF STAGE-DISCHARGE RELATIONSHIPS AFFECTED BY UNSTEADY FLOW,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
D. L. Fread.
Water Resources Bulletin, Vol 11, No 2, p 213-228, April 1975. 10 fig, 1 tab, 7 ref.

Descriptors: *Unsteady flow, *Stage-discharge relations, *Mathematical models, Open channel flow, Hysteresis, Mississippi River, Equations, Mannings equation, Floods, Discharge(Water), Hydrographs, *Louisiana.
Identifiers: Red River(La), Atchafalaya River(La).

The dynamic relationship between stage and discharge which is unique to a particular flood for a selected station along the river can be determined via a mathematical model based on the complete one-dimensional equations of unsteady flow, i.e., the equations for the conservation of mass and momentum of the flood wave and the

Manning equation. By assuming the bulk of the flood wave moves as a kinematic wave, the need for spatial resolution of the flood can be eliminated, and only the time variation of either the discharge or stage at the selected station is necessary for the computation of the other. The mathematical model can be used in river forecasting to convert the forecast discharge hydrograph into a stage hydrograph which properly reflects the unique dynamic stage-discharge relationship produced by the variable energy slope of the flood discharge. The model can be used also in stream gaging to convert a recorded stage hydrograph into a discharge hydrograph which properly accounts for the effects of unsteady flow. A simple, easily-applied graphical procedure was provided for estimating the magnitude of the effect of the unsteady flow on stage-discharge ratings. (Dawes-ISWS)
W75-07932

ON THE IMPOSSIBILITY OF A PARTIAL MASS VIOLATION IN SURFACE RUNOFF SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
M. H. Diskin, A. Boneh, and A. Golan.
Water Resources Research, Vol 11, No 2, p 236-244, April 1975. 9 fig, 9 ref.

Descriptors: *Surface runoff, *Systems analysis, *Rainfall-runoff relationships, Hydrographs, Hydrologic cycle, Hydrology, Flood flow, Hydrologic systems, Input-output analysis, Optimization, Theoretical analysis, Model studies.
Identifiers: *Mass conservation, Kernel functions. Linear systems, Watershed response functions.

The class of nonnegative, initially relaxed, and non-anticipating systems has many applications in engineering. A proof was given to a theorem stating that in this class of systems, if the input total mass is equal to the output total mass, then for any nonnegative input-output pair, the system fulfills also a partial mass condition. By applying this theorem to systems expressed by the Volterra series it was concluded that the input functions must be bounded. Two such bounds on the input functions were considered: (1) bounds resulting from the requirement of a nonnegative output and (2) bounds resulting from the mass-conserving property of the system. The theorem mentioned above implies that the set of input functions causing nonnegative output functions is a subset of the set of input functions that do not violate the mass-conserving property of the system. It is therefore clear that the bounds of type 1 are the dominant among the two bounds for any nonnegative input function. In a system expressed by an Nth order Volterra series the bounds on the input can be evaluated by solving a polynomial inequality of order N - 1. An example was given for a system expressed by a third-order Volterra series in which the bounds on the input form two regions. Explicit equations for the bounds of type 1 and 2 were derived for a second-order system. (Lee-ISWS)
W75-07934

NONLINEAR KINEMATIC WAVE APPROXIMATION FOR WATER ROUTING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
R-M. Li, D. B. Simons, and M. A. Stevens.
Water Resources Research, Vol 11, No 2, p 245-252, April 1975. 8 fig, 16 ref.

Descriptors: *Flood waves, *Overland flow, *Sheet flow, *Rainfall-runoff relationships, *Surface runoff, Hydrographs, Channel flow, Open channel flow, Storm runoff, Routing, Model studies, Simulation analysis, Rainfall, *Mathematical models.
Identifiers: *Kinematic waves, *Nonlinear waves, Watershed response.

A simple numerical model for both overland and channel water routing was presented. A second-order nonlinear scheme was developed to solve the kinematic wave equation with the boundary condition of time variant inflows. The numerical solutions agreed very well with analytical solutions which were available for some particular cases. This model includes the effects of rainfall on flow resistance and simulates hydrographs which agree very well with experimental results for both constant rainfall and variable rainfall cases. The interesting phenomena of 'pip' and 'dip' in overland flow hydrographs were successfully simulated. These phenomena were found to be the results of sudden changes of flow resistance due to ceasing or starting of rainfall. The same routing procedure for overland flow was employed to route flow in natural channels. (Lee-ISWS)
W75-07935

SHORT-PERIOD INTERNAL WAVES IN THE SEA,
L. M. Brekhovskikh, K. V. Konjaev, K. D. Sabinin, and A. N. Serikov.
Journal of Geophysical Research, Vol 80, No 6, p 856-864, February 20, 1975. 14 fig, 12 ref.

Descriptors: *Internal waves, *Oceans, *Thermocline, Frequency, Wavelengths, Statistical methods, Temperature, Measurement, Atlantic Ocean.
Identifiers: Spectra, Oscillations, Black Sea, Caspian Sea, Indian Ocean.

Results of measurements of short-period internal waves(periods less than one hour) in the seasonal thermocline in the Black and Caspian Seas and some regions of the Atlantic and Indian Oceans were discussed. The line sensors of temperature (i.e., pieces of wire whose electrical resistance varies in accordance with the average temperature of the layer between the ends of the sensor) were widely used. The lengths of the line sensors used varied from 1 to 100 m. Measurements were made with arrays of such sensors in the horizontal plane and along the vertical. Records obtained were much more regular than those of point temperature sensors and were easy to analyze. It appeared often that short-period internal waves exist as groups (trains) of quasi-harmonic oscillations. The frequency and wave number in the group are nonstable. The lowest mode of the oscillations is predominant. Sometimes the waves are standing ones. (Sims-ISWS)
W75-07976

WATER RESOURCES DEVELOPMENT BY THE U.S ARMY CORPS OF ENGINEERS IN ARIZONA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W75-07979

A LINEAR THEORY OF INTERNAL WAVE SPECTRA AND COHERENCES NEAR THE VAISALA FREQUENCY,
Woods Hole Oceanographic Institution, Mass.
Y. J. F. Desaubies.
Journal of Geophysical Research, Vol 80, No 6, p 895-899, February 20, 1975. 6 fig, 2 tab, 11 ref.

Descriptors: *Internal waves, *Oceans, *Model studies, *Theoretical analysis, Temperature, Velocity, Mathematical models, Energy.
Identifiers: *Spectra, Coherence, *Vaisala frequency.

Various internal wave frequency spectra of temperature, velocity, and coherences were computed by using linear wave functions and the energy model of Garrett and Munk. The emphasis was on the frequency range close to the Vaisala frequency n, where it was predicted that temperature spectra and coherence have a peak before a sharp cutoff. The model was strongly dependent on the local value of n, its vertical gradient, and the wave number bandwidth of the wave field. (Sims-ISWS)
W75-07985

A BOTTOM CURRENT ALONG THE SHELF BREAK,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
J. A. Johnson, and P. D. Killworth.
Journal of Physical Oceanography, Vol 5, No 1, p 185-188, January 1975. 2 fig, 4 ref.

Descriptors: *Ocean circulation, *Continental shelf, Mathematical studies, Upwelling, Continental slope, Oceanography, Currents(Water).
Identifiers: *Ekman layer.

The theory of Hill and Johnson for upwelling over the shelf break was modified to give agreement with the work of Killworth. It was shown that when upwelling occurs over a discontinuity in bottom slope, this upwelling does not penetrate into the surface Ekman layer. Associated with this upwelling is a strong current along the shelf break in the bottom Ekman layer. (Sims-ISWS)
W75-07986

ENVIRONMENTAL ASSESSMENT OF SEDIMENT SOURCES AND SEDIMENTATION DISTRIBUTIONS FOR THE LAKE LA FARGE WATERHSED AND IMPOUNDMENT,
Wisconsin Univ., Madison. Dept. of Geography.
J. C. Knox, P. J. Bartlein, and W. C. Johnson.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 77-116. 22 fig, 15 tab, 12 ref. DACW 37-C-0130.

Descriptors: *Sediment yield, *Sedimentation, *Reservoirs, Wisconsin, Tributaries, Sediment control, Climates, Deltas, Sands, Sediment transport, Sedimenation rates, Silts, Costs, Drainage patterns, Watershed management, Land use, Channel improvement, Spawning, Dams, Streams, Runoff.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis), Sediment traps.

Maps of the drainage network of Wisconsin's La Farge impoundment watershed and sub-basin watersheds were used to inventory the potential sediment yield from the sub-basin tributaries, identify potential sites for sedimentation control structures, and inventory costs of sediment control measures within the impoundment drainage network. During the monitoring period, there has been below average flooding, sediment pollution, and probably nutrient pollution, and a climatic shift toward cooler, wetter weather. The average yield of sediment to the reservoir is computed to be about 390 tons/sq mile of drainage. The most critical sediment problem will be formation of deltas where tributaries enter the impoundment. Recommendations include flood retention reservoirs as sediment traps in selected tributaries; fish spawning areas in the impoundment pool to be protected by maintaining suitable water levels, low-head dams and shaping of the valley floor for Weister Creek valley bottom, upland land use management and control of stream bank erosion. Further investigations should be undertaken to better calibrate the impact of climate regimes and climate variability as they control and modify the interactions among runoff, sediment yield, and nutrient pollution. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08161

COMPARISON OF INTERMITTENT AND PERMANENT STREAMS OF CALCAREOUS PROVENCE, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Lab. for Animal Biology-Ecology.
P. Legier, and J. Talin.
Ann Limnol, Vol 9, No 3, p 273-292, 1973. Illus.
Identifiers: *Calcareous provence, Diptera, Intermittent streams, Permanent streams, Phreatic sheet, *Streams, Trichoptera, *France, Dry periods, Biota.

Comparison of intermittent and permanent streams in France was made to determine their affinities. Stability of physical and chemical factors was observed in the permanent streams and in the lotic period of intermittent streams. The stagnant period of intermittent streams is unstable. The biotic comparisons show the affinities between permanent lentic streams and intermittent streams. Permanent lotic streams and intermittent streams show very little similarity. Some specific populations (e.g. Trichoptera, Diptera) can maintain themselves during the dry period only when the phreatic sheet is present in depth.--Copyright 1974, Biological Abstracts, Inc.
W75-08261

2F. Groundwater

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1974, A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N Mex.
For primary bibliographic entry see Field 4B.
W75-07857

SOME UPPER MIOCENE AND PLIOCENE OSTRACODA OF ATLANTIC COASTAL REGION FOR USE IN THE HYDROGEOLOGIC STUDIES,
Geological Survey, Reston, Va.
F. M. Swain.
Supt of Documents, GPO, Washington, DC 20402, for $1.85. Professional Paper 821, 1974. 50 p, 1 fig, 13 plate, 1 tab, 118 ref.

Descriptors: *Stratigraphy, *Atlantic Coastal Plain, *Aquifers, Hydrogeology, Geologic formations, Geologic time, Geologic units, Southeast US.
Identifiers: *Ostracoda.

As a part of a U.S. Geological Survey research project dealing with the permeability of sedimentary rocks in the Atlantic Coastal Plain, the Ostracoda were studied from many surface localities and well samples. Upper Miocene and Pliocene outcrop samples from North Carolina and Virginia yielded 63 species and seven subspecies of Ostracoda. The stratigraphic distribution of the species indicates the presence of an assemblage, the Aurila conradi-Thaerocythere schmidtae assemblage, that also extends into the Pliocene in southern North Carolina and South Carolina. A subassemblage, the Radimella confragosa subassemblage, represents the upper Miocene and Pliocene in southern North Carolina and in South Carolina. T. schmidtae appears to represent a cooler water subassemblage of the upper Miocene in northern North Carolina, Virginia, and southernmost Maryland. Two new genera, two new species, and one new subspecies are described. The new genera are Prodictyocythere, n. gen., and Shattuckocythere, n. gen. The new species are Murrayina macleani, n. sp., and Prodictyocythere trapezoidalis, n. sp. The new subspecies is Pontocythere agricola duopunctata, n. subsp. (Knapp-USGS)
W75-07860

HYDROGEOLOGIC AND WATER-QUALITY DATA IN WESTERN JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
W. E. Hofstra, and D. C. Hall.
Colorado Water Resources Basic-Data Release No 36, 1975. 51 p, 2 fig, 12 tab, 8 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Colorado, Surface waters, Groundwater, Water quality, Streamflow, Water wells.
Identifiers: *Jefferson County(Colo).

Information is presented on the availability of water for domestic supply in the mountainous area in Jefferson County, Colo. The area covered by the study is roughly 300 square miles of mountainous Jefferson County extending from Clear Creek on the north to the Pike National Forest boundary on the south and from the east edge of the Front Range mountains to the western boundary of the county. The population of the mountainous part of the county was roughly 20,000 in 1974. Hydrologic data were collected at 34 streamflow sites. Bacteriological and chemical analyses of surface waters are given for 32 sites. During the study, 31 springs and 727 wells were sampled. Comprehensive bacteriological and chemical analyses of samples collected from 38 wells and 1 spring are given. Eleven test wells were drilled by air-percussion. Geologic logs and hydrologic test data for these wells are given. (Knapp-USGS)
W75-07862

GROUND-WATER RESOURCES OF THE WESTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
L. J. Crain.
New York State Department of Environmental Conservation, Albany, Basin Planning Report ORB-5, 1974. 137 p, 26 fig, 3 plate, 7 tab, 54 ref.

Descriptors: *Water resources, *Groundwater, *New York, Glacial drift, Alluvial channels, Lakes, Surface-groundwater relationships, Water yield, Hydrologic data, Basic data collections.
Identifiers: *Oswego River Basin(NY).

Groundwater occurrence, aquifer yield, and geology are described for the 2,600-square mile area of the Western Oswego River basin in central New York, which includes the drainage basins of the four largest Finger Lakes: Cayuga, Seneca, Keuka, and Canandaigua. Aquifer data are summarized in geologic sections, diagrams, and maximum yield maps. Groundwater is generally available throughout the basin in quantities sufficient for domestic and farm supplies and, in many places, in quantities sufficient for municipal and industrial supplies. Nine to 12 mgd of groundwater is used in the basin, and several times this amount is available for future development. The principal aquifers are unconsolidated glacial sand and gravel deposits in the large valleys of the southern half of the basin, where well yields of 1,000 gpm or more are possible. In the northern part of the basin, the most important sources of groundwater are deposits adjacent to and in hydraulic contact with the Barge Canal. Direct groundwater recharge from precipitation ranges from about 20 million gallons per year per square mile for areas underlain by glacial till to 262 million gallons per year per square mile for areas underlain by sand and gravel in the south. (Knapp-USGS)
W75-07864

GENESIS OF HYDROGEOCHEMICAL FACIES OF GROUND WATERS IN THE PUNJAB REGION OF PAKISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-07865

KARST HYDROLOGY OF NORTHERN YUCATAN PENINSULA, MEXICO,
Geological Survey, Reston, Va.
V. T. Stringfield, and H. E. LeGrand.
In: Field Seminar on Water and Carbonate Rocks of the Yucatan Peninsula, Mexico; published for Field Trip 2, 1974 Annual Meeting, Miami, of the Geological Society of America: New Orleans Geological Society, p 26-44, 1974. 2 fig, 37 ref.

Descriptors: *Karst hydrology, *Hydrogeology, *Mexico, Water chemistry, Saline water intrusion, Surface-groundwater relationships, Groundwater movement.
Identifiers: *Yucatan(Mexico).

Northern Yucatan is underlain by nearly horizontal Tertiary formations consisting chiefly of limestone and other soluble rocks. Karst features in Yucatan may be divided into two groups: (1) surficial features that do not extend more than a few meters below the surface, and (2) deep features as sinkholes, solution shafts, and solution cavities that affect the permeability of the rocks and circulation of the water far below the surface. Many of the numerous sinkholes in the limestone are natural water wells known as cenotes which were a source of water for the Mayan cities. At Chichen Itza one cenote was used for water supply and one was used for sacrifice. Although the annual rainfall is as much as 2,000 mm, there are no surface streams because water on the surface moves freely into the underlying limestone. After reaching the zone of saturation in the limestone, the water moves laterally to the coast where part of it is discharged through cenotes and other openings. Such discharge is controlled in part by the relation of the freshwater head of the aquifer to the head of seawater. Although the altitude of the water level in the limestone aquifer away from the coast is not more than a few meters, it is sufficient to prevent seawater encroachment in the upper part of the aquifer. However, it apparently is not sufficient to keep seawater out of the lower part of the aquifer throughout the peninsula. (Knapp-USGS)
W75-07873

ENVIRONMENTAL TRITIUM IN THE EDWARDS AQUIFER, CENTRAL TEXAS, 1963-71,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07885

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, 1975.
Geological Survey, Columbus, Ohio.
For primary bibliographic entry see Field 7C.
W75-07886

THE RELEVANCE OF AQUIFER-FLOW MECHANISMS TO EXPLORATION AND DEVELOPMENT OF GROUNDWATER RESOURCES,
Department of Aquifer-Flow Mechanisms to Exploration and Development of Groundwater Resources,
For primary bibliographic entry see Field 4B.
W75-07896

DIGITAL SIMULATION MODEL OF AQUIFER RESPONSE TO STREAM STAGE FLUCTUATION,
California Univ., Davis. Dept. of Water Science and Engineering.
M. A. Marino.
Journal of Hydrology, Vol 25, No 1/2, p 51-58, April 1975. 6 fig, 7 ref, 1 append.

Descriptors: *Computer models, *Surface-groundwater relationships, Streams, Water table aquifers, Water level fluctuations, Numerical analysis, Groundwater movement, Hydraulic properties, Hydraulic conductivity, Boundaries(Surfaces), Equations, Aquifers, *Simulation analysis.
Identifiers: *Aquifer response, *Semipervious stream banks, Predictor-corrector scheme, Non-uniform grid, Dimensionless variables.

A digital computer model was presented that simulates the response of an unconfined aquifer to changes in stream stage. The aquifer was considered to be finite, homogeneous, and isotropic. The stream was considered to have semipervious banks. The hydraulic conductivity of the semipervious layer of the streambed was assumed smaller than that of the aquifer, and the storage capacity of the semipervious layer was assumed insignifi-

cant. Numerical solutions describing the water level fluctuation in the aquifer due to an arbitrarily varying flood pulse in the stream are obtained by a predictor-corrector scheme with a nonuniform grid spacing. The numerical scheme is unconditionally stable. (Visocky-ISWS)
W75-07897

GROUND-WATER POLLUTION BY WOOD WASTE DISPOSAL,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 5B.
W75-07951

FLUORINE IN GROUND WATER AS A GUIDE TO PB-ZN-BA-F MINERALIZATION,
Toronto Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-07953

A STUDY OF CONVECTIVE-DISPERSION EQUATION BY ISOPARAMETRIC FINITE ELEMENTS,
State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.
For primary bibliographic entry see Field 5B.
W75-08009

DENITRIFICATION IN LABORATORY SANDY COLUMNS,
Soil Conservation Service, Effingham, Ill.
For primary bibliographic entry see Field 5B.
W75-08189

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS, I. CONCENTRATION-TIME RELATIONSHIPS,
Water Planning for Israel Ltd., Tel-Aviv.
For primary bibliographic entry see Field 2K.
W75-08190

A GALERKIN-FINITE ELEMENT TECHNIQUE FOR CALCULATING THE TRANSIENT POSITION OF THE SALTWATER FRONT,
Princeton Univ., N.J. Dept. of Civil and Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-08195

2G. Water In Soils

THE INFLUENCE OF WIND VELOCITY ON THE SIZE DISTRIBUTIONS OF AEROSOLS GENERATED BY THE WIND EROSION OF SOILS,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2J.
W75-07915

MICROSCALE TRANSPORT OF SAND-SIZED SOIL AGGREGATES ERODED BY WIND,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2J.
W75-07916

POND WATER QUALITY IN A CLAYPAN SOIL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-07924

FINITE ELEMENT ANALYSIS OF TWO-DIMENSIONAL FLOW IN SOILS CONSIDERING WATER UPTAKE BY ROOTS: I. THEORY,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
S. P. Neuman, R. A. Feddes, and E. Bresler.
Soil Science Society of American Proceedings, Vol 39, No 2, p 224-230, March-April 1975. 3 fig, 1 tab, 8 ref, 1 append.

Descriptors: *Finite element analysis, *Soil water movement, *Unsaturated flow, *Soil-water-plant relationships, *Root systems, Absorption, Numerical analysis, Mathematical models, Soil moisture, Porous media, Hydraulic conductivity, Flow, Air-earth interfaces, Boundaries(Surfaces), Seepage, Infiltration, Anisotropy, Equations, Evaporation.
Identifiers: *Two-dimensional flow, *Galerkin method, Soil-root interface, Weighted residuals, Iteration, Convergence.

The problem of two-dimensional nonsteady flow of water in unsaturated and partly saturates porous media was solved by a Galerkin-type finite element approach. Particular emphasis was placed on the simulation of atmospheric boundaries and on water uptake by plant roots. The finite element method was shown to have several advantages over conventional finite difference techniques. It can easily handle nonuniform flow regions having irregular boundaries and arbitrary degrees of local anisotropy. Nonlinear atmospheric boundary conditions along evaporation or infiltration surfaces and along seepage faces were handled by a unique procedure. This iterative procedure relies on the ease with which flux normal or any boundary of the flow region is assigned in the finite element approach. Experience with this method indicates that rapid rates of convergence can be achieved in many cases. (See also W75-07942) (Visocky-ISWS)
W75-07941

FINITE ELEMENT ANALYSIS OF TWO-DIMENSIONAL FLOW IN SOILS CONSIDERING WATER UPTAKE BY ROOTS: II. FIELD APPLICATIONS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
R. A. Feddes, S. P. Neuman, and E. Bresler.
Soil Science Society of America Proceedings, Vol 39, No 2, p 231-237, March-April 1975. 12 fig, 6 ref.

Descriptors: *On-site tests, *Field crops, *Mathematical models, *Finite element analysis, *Soil water movement, Unsaturated flow, Soil-water-plant relationships, Root systems, Anisotropy, Absorption, Numerical analysis, Soil moisture, Hydraulic conductivity, Evapotranspiration, Ditches, Water table, Soil properties, Hydraulic gradient, Infiltration, Simulation analysis.
Identifiers: *Red cabbage.

Part I described a Galerkin-type finite element approach to the simulation of two-dimensional transient flow in saturated-unsaturated soils considering evaporation and water uptake by roots. The purpose of Part II was to verify the numerical model against field measurements, to compare the results with those obtained by a finite difference technique, and to show how the finite element method can be applied to complex but realistic two-dimensional flow situations. Two examples were given. The first concerns one-dimensional flow and it compares numerical results with those obtained experimentally in the field from water balance studies on red cabbage (Brassica oleracea L. 'Rode Herfst') grown on a clay soil in the presence of a water table. The second example describes two-dimensional flow in a complex field situation in The Netherlands where flow takes place under cropped field conditions through five anisotropic layers. Water is supplied to the system by infiltration from two unlined ditches and is withdrawn from the system by evapotranspiration and by leakage to an underlying pumped aquifer. (See also W75-07941) (Visocky-ISWS)
W75-07942

EVALUATING SURFACE-SOIL WATER CONTENT BY MEASURING REFLECTANCE,
Agricultural Research Service, Manhattan, Kans.
E. L. Skidmore, J. D. Dickerson, and H. Schimmelpfennig.
Soil Science Society of American Proceedings, Vol 39, No 2, p 238-242, March-April 1975. 7 fig, 1 tab, 24 ref.

Descriptors: *Soil moisture meters, *Soil moisture, *Instrumentation, Soil water, Soil surfaces, Reflectance, Soil erosion, Infrared radiation, Soils, Soil properties.
Identifiers: *Reflectometers, Integrating sphere, Light chopper, Infrared detectors.

Water's property to absorb certain wavelengths in the near infrared was the basis for developing a reflectometer to measure reflectance of near-infrared radiation from a soil surface. The reflectometer's essential elements include: source of infrared radiation, optical system, integrating sphere, detector, light chopper, amplifier, and meter system. The radiation from an incandescent lamp was filtered with a narrow-band pass filter, chopped, and allowed to strike the test surface where it was either absorbed or reflected onto the surface of the integrating sphere. The intensity of the reflected radiation was measured with a lead sulfide detector and appropriate amplifer and meter. The reflectance as a function of water content was measured for filter paper and several soils at 1.30, 1.45, 1.65, and 1.95 micrometers. Although at low water contents soil properties (other than water content) strongly influenced soil reflectance, at 1.95-micrometer wavelength--the most prominent absorption band of liquid water--the reflectance-water content relationship tended to be log-linear. (Sims-ISWS)
W75-07943

DRAINAGE CHARACTERISTICS OF SOILS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
A. T. Corey, and R. H. Brooks.
Soil Science Society of America Proceedings, Vol 39, No 2, p 251-255, March-April 1975. 5 fig, 12 ref.

Descriptors: *Soil moisture, *Soil water movement, *Conductivity, *Pore pressure, Drainage effects, Percolation, Moisture tension, Moisture content, Negative pore pressure, *Drainage.
Identifiers: Soil water suction.

Evidence was obtained indicating that neither water conductivity nor water content are single-valued functions of soil water suction during a period in which soil is draining continuously. Functional relationships between water conductivity and soil water suction measured during continuous drainage were found to be different from those frequently observed during steady-state experiments. During drainage, a finite suction is recorded before a soil begins to desaturate and this suction is often larger than the suction existing immediately after drainage starts. It was postulated that the reduction in suction is a result of air reaching larger (previously isolated) pores. (Gibb-ISWS)
W75-07944

PREDICTION OF INFILTRATION OF WATER INTO AGGREGATED CLAY SOIL SAMPLES,
Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Soil Science.
F. A. Gumbs, and B. P. Warkentin.
Soil Science Society of America Proceedings, Vol 39, No 2, p 255-263, March-April 1975. 12 fig, 4 tab, 20 ref.

Descriptors: *Soil properties, *Infiltration, *Aggregates, Model studies, Laboratory tests, Hysteresis, Conductivity, Diffusivity, Soil pressure, Retention, Wetting, Drying, Moisture content, Percolation, Gravity, Tensiometers, Bulk density, Stability, Sampling.
Identifiers: *Soil columns, *Diffusion equation, Pore size distribution.

Physical properties--stability, water retention, diffusivity, and conductivity--relevant to the study of infiltration into aggregated media were measured for four aggregate sizes. These media were considered stable to infiltration. The hysteresis in moisture retention, equilibrium moisture retention curves, and the changes in moisture retention with time were measured for confined and unconfined samples of the aggregates. Wetting and drying diffusivities and conductivities were also measured and used in the prediction of horizontal and vertical infiltration under zero and small negative pressures into columns of each aggregate size by using the diffusion equation. Diffusivities and conductivities were larger on wetting than on drying and generally larger in unconfined than in confined samples. Horizontal and vertical infiltration were reasonably well predicted when water infiltrated under negative pressure and the diffusivities and conductivities used were calculated from infiltration profiles developed under the same water tension. For these media, the values of water tension, diffusivity, and conductivity at any water content depend on the rate of wetting. The values to be used in the prediction of infiltration must therefore be measured for times of wetting which correspond to the duration of infiltration. The classical diffusion equation can be used to predict infiltration into aggregated clay soils if the correct diffusivities and conductivities are used. (Schicht-ISWS)
W75-07945

SOIL MOISTURE MEASUREMENT AND ASSESSMENT,
Australian Water Resources Council, Canberra.
Australian Water Resources Council Hydrological Series No 9, 1974. 44 p, 2 fig, 53 ref, 1 append.

Descriptors: *Soil moisture, *Measurement, *Instrumentation, Methodology, Soil water, Capillary water, Soil moisture meters, Nuclear moisture meters, Tensiometers, Gravimetric analysis, Sampling, Australia.

Procedures for the measurement of soil moisture were discussed. Instrumentation was evaluated, and the economics of various methods were described. Some of the conclusions were: (1) Soil moisture content measurements are best made by using the gamma ray absorption method in the laboratory and the neutron thermalization method in the field. These methodss may be supplemented by gravimetric sampling. (2) Soil moisture potential is best measured by using tensiometers or thermocouple psychrometers either in the laboratory or the field. The choice of method will be determined by the range of expected values. (3) Stored soil moisture should be determined by using the neutron thermalization method in permanent access tubes. (Sims-ISWS)
W75-07952

A PATTERN OF HUMUS HORIZON IN TUNDRA'S LOAMY SOILS IN THE NORTHEASTERN EUROPEAN TUNDRA,
For primary bibliographic entry see Field 2C.
W75-07969

EFFECT OF INTERACTION OF FACTORS ON WILT OF CORIANDER CAUSED BY FUSARIUM OXYSPORUM SCHLECHT EX. FR. F. CORIANDERII KULKARNI, NIKAN ET JOSHI,
Rajasthan Agriculture Dept., Kota (India).
For primary bibliographic entry see Field 2I.
W75-07983

MOVEMENT OF TWO NONIONIC SURFACTANTS IN WETTABLE AND WATER-REPELLENT SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
W. W. Miller, N. Valoras, and J. Letey.
Soil Science Society of America Proceedings, Vol 39, No 1, p 11-16, January-February 1975. 7 fig, 1 tab, 11 ref. OWRR B-072-CAL(10), B-141-CAL(1).

Descriptors: *Surfactants, *Leaching, Soil properties, *Soil water movement, Wettability, Hydrodynamics, Conductivity, Adsorption, Percolation, Infiltration, Permeability, Porous media.
Identifiers: *Nonionic surfactants, *Hydrophobic soils, *Water repellancy.

The movement of two nonionic surfactants (Soil Penetrant 3685, Aqua Gro) and their effect on water flow through wettable and water repellent soils was investigated. Surfactant concentrations of 0, 100, 500, 1000, 1600, and 3200 ppm were applied to the top of vertical soil columns and the concentration of surfactant in the column effluent was measured. When the concentration of surfactant in the effluent did not significantly change with time, leaching of the columns with tap water was initiated. Both surfactants affected the hydraulic conductivity of the hydrophobic soil. The conductivity effects appeared to be related to aggregate destabilization, micelle formation, and particle migration, all of which caused a general decrease of flow rates with time. Adsorptive characteristics were found to affect greatly the shape of the effluent concentration versus time curve. Aqua Gro was shown to be more strongly adsorbed and less subject to leaching than was Soil Penetrant. A theoretical model was tested for its ability to qualitatively predict experimental effluent concentrations. Allowing for the spreading effects of dispersion, there was reasonable agreement between most experimental and theoretical values. The behavior and movement of surfactants in soils are a function of adsorption isotherms, mixing or dispersion due to flow velocities, solute concentration, and the physical and chemical characteristics of the porous medium. (Sanderson-ISWS)
W75-07984

DISTRIBUTION OF NONIONIC SURFACTANT IN SOIL COLUMNS FOLLOWING APPLICATION AND LEACHING,
California Univ., Riverside.
W. W. Miller, and J. Letey.
Soil Science Society of America Proceedings, Vol 39, No 1, p 17-22, January-February 1975. 7 fig, 1 tab, 6 ref. OWRR B-072-CAL(11) and B-141-CAL(8).

Descriptors: *Surfactants, *Agricultural chemicals, *Infiltration, *Percolation, Wettability, Wetting, Soil physical properties, Leaching, Penetration, Seepage, Permeability, Soil properties, Adsorption, Conductivity, Distribution patterns.
Identifiers: *Water repellency, *Water drop penetration time, *Nonionic surfactants.

The distribution of 14C-tagged surfactant (Soil Penetrant) was observed in soil columns following application of various concentrations and leaching under unsaturated flow on wettable (Pachappa) and water-repellent (Morris Dam) soils. The maximum depth of surfactant penetration for a given leaching period was greater for Pachappa than for Morris Dam. Following leaching there was a more uniform distribution of surfactant throughout the column of Pachappa soil. Water drop penetration time (WDPT) experiments showed good correlation between experimental distribution as determined by 14C tracing and actual reduction of water repellency to a given depth. Consequently, the movement and distribution characteristics of a non-14C-tagged surfactant (Aqua Gro) on the Morris Dam soil following application and leaching was qualitatively examined by the WDPT method. A theoretical model was tested for its ability to qualitatively predict experimental Soil Penetrant distributions. There was reasonable agreement between experimental and calculated distributions. Specific adsorptive characteristics at low equilibrium concentrations were found to be very important to surfactant distribution in a given soil. (Sanderson-ISWS)
W75-07987

FLOW AND RETENTION OF WATER IN THE STRATIFIED SOILS OF THE OROVADA, NEVADA, AREA,
Nevada Univ., Reno. Dept. of Soil Science.
G. B. Muckel.
Available from the National Technical Information Service, Springfield, Va 22161, as PB-241 979, $5.25 in paper copy, $2.25 in microfiche. Ms Thesis, June 1974. 98 p, 32 fig, 19 tab, 39 ref, append. OWRR A-031-NEV(1).

Descriptors: *Flow, *Retention, *Water storage, *Stratification, *Soil types, *Nevada, Groundwater, Infiltration, Moisture tension, Soil moisture, Soil water, Movement, Irrigation water, Irrigation operation and maintenance, Plant growth, Soil-water-plant relationships, Laboratory tests, Permeameters, On-site data collections.
Identifiers: *Orovada area(Nev), *Neutron probes, *Alfalfa seed production, Plant yield.

Stratified soils of the Orovada area hold more water than predicted by an estimate based on uniform soils. The amount of available water held by three different soils was found. The Rebel-like soil held 21.8% by volume, the Orovada-like soil 23.2%, and the Bloor-like soil 21.4%. These values, determined by field tests, were higher than the available water contents estimated by measurements of each layer made in the laboratory. They demonstrate that the available water retained by a soil is determined by characteristics of the soil that are destroyed during sampling and sample preparation. In four instances, the greatest increase of available water per unit depth of soil was found in the soil adjacent to a coarse layer. There was not an increase adjacent to a coarse layer in three instances. Due to the area of sensitivity of the neutron probe, exact amounts of water at point locations could not be determined. Rates of water movement were determined. The unsaturated hydraulic conductivities calculated from field measurements seemed erratic, possibly because all flow was assumed vertical. Nonuniformity of soil within the basins used in the field tests could also account for some inconsistency. Measurements of water content at point locations within a soil are needed for determination of unsaturated hydraulic conductivity. The neutron probe does not measure soil water content at point locations but averages it in the probe's sphere of sensitivity. These findings are part of the basic data needed to correctly assess the frequency and dates of irrigation to provide the moisture requirements for alfalfa seed production. (Prickett-ISWS)
W75-07991

METHODS FOR CALCULATING UNSATURATED HYDRAULIC CONDUCTIVITY AND SOIL WATER DIFFUSIVITY DURING VERTICAL INFILTRATION IN A DRY SOIL,
Ghent Rijksuniversiteit (Belgium). Soil Physics, Soil Conditioning and Horticultural Soil Sciences Lab.
H. Verplancke, and M. De Boodt.
Meded Fac Landbouwwet Rijksuniv Gent. Vol 38, No 2, p 440-449, 1973, Illus.
Identifiers: Dry soils, *Hydraulic conductivity, *Infiltration, *Soil water diffusivity, Methodology.

Two methods were used for calculating the unsaturated hydraulic conductivity (k) and the soil water diffusivity (D) during vertical soil water infiltration after irrigation. The values of k and D were obtained in 2 ways: according to a theory of

Gardner (1970) and according to a theory of De Boodt et al (1967). These methods are based on complete different theories. Gardner proposed a method to calculate the soil water diffusivity in the field during drainage of a wetted profile from the time rate of decrease of the matric potential at several depths in the profile. De Boodt et al. published a method where the unsaturated hydraulic conductivity can be calculated by using Darcy's law. The matric potential and volumetric water content of a field soil was determined with simply constructed electrical resistance units. The obtained soil water contents were compared with those determined with the neutron method. Both methods yield reasonably satisfactory values for the unsaturated hydraulic conductivity.--Copyright 1974, Biological Abstracts, Inc.
W75-08064

MICROMORPHOLOGY OF TWO SOIL PROFILES IN FUDHALIYAH,
Foundation of Scientific Research, Baghdad (Iraq).
A. H. Al-Rawi, and M. Knibbe.
Institute for Applied Research on Natural Resources, Abu-Ghraib, Iraq, Technical Bulletin 53, November 1973. 28 p, 3 tab, 5 fig, 3 append, 7 ref.

Descriptors: *Soil physical properties, *Soil profiles, *Salinity, Soil structure, Land reclamation, Soil formation, Irrigation, Hydraulic conductivity, Aeration, Calcite, Carbonates.
Identifiers: *Iraq(Fudhaliyah).

Micromorphology studies of soil formation in Fudhaliyah were carried out to determine reclamation potential. Two representative soil profiles were selected, one with favorable physical properties and one without. Data were collected on soil porosity, structure, salinity, and other features. Both soils developed in young alluvial deposits, mainly from irrigation water. As a result both have weak structure development, although one was considerably more saline. Soil porosity was low and although aeration was sufficient, hydraulic conductivity is expected to be too low to allow sufficient leaching of harmful salts. Recommendations include extending studies to other sample areas of large land reclamation areas of the Lower Mesopotamian Plain. (Mastic-Arizona)
W75-08118

PREDICTING VERTICAL MOVEMENT OF MANURIAL NITROGEN IN SOIL,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-08192

SEASONAL VARIATION IN SOME PHYSICAL, CHEMICAL, AND MICROBIOLOGICAL CHARACTERISTICS OF A SALINE AND A NON-SALINE SOIL NEAR ABU-GHRAIB, IRAQ,
Foundation of Scientific Research, Baghdad (Iraq).
Y. Z. Ishac, and A. N. Yousef.
Institute for Applied Research on Natural Resources, Baghdad, Technical Bulletin No. 49, November 1973. 37 p, 19 tab, 30 ref.

Descriptors: *Saline soils, *Soil microbiology, *Soil bacteria, *Seasonal, *Salinization, *Soil temperature, *Soil microorganisms, *Soil physical properties, *Alkalinity, *Soil moisture.
Identifiers: *Iraq.

A comparison was made of some physicochemical and microbiological properties of a saline and a non-saline soil in order to study seasonal changes in soil properties that may be related to salinity. Non-saline cultivated soil supported higher numbers of different physiological groups of bacteria than uncultivated saline soil. Microbial activity was correlated with the amounts of organic matter present, especially in the cultivated soil. Maximum bacterial counts were recorded in the spring and autumn, while minimum counts occurred in winter and summer. Salinity proved the major factor limiting microbial activity in uncultivated soil. (Mastic-Arizona)
W75-08199

UTILIZING CLIMATE-MOISTURE-WATER USE RELATIONSHIPS IN IMPROVING SOIL MOISTURE BUDGET METHOD FOR IRRIGATION SCHEDULING,
Punjabrao Krishi Vidyapeeth, Akola (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W75-08275

SOME ENZYME AND RESPIRATORY ACTIVITIES OF TROPICAL SOILS FROM NEW HERBRIDES,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
D. J. Ross.
Soil Biol Biochem, Vol 5, No 5, p 559-567, 1973.

Descriptors: *Enzymes, *Soil chemistry, Soil bacteria, Soil moisture.
Identifiers: Amylase, Dehydrogenase, *New hebrides, Invertase, Soil enzymes, Tropical soils, Soil respiration.

Activities of invertase and amylase and respiratory activities of samples of 11 soils from New Herbrides were determined. The soils mostly were under forest and were acid with medium to low C/N ratios. Invertase activities were rather low but amylase activities were similar to those found in New Zealand soils. The ratio of invertase to amylase activities were mostly low. O2 uptakes mostly responded markedly to glucose. Most values of respiratory quotients were about 1.0. Most, but not all, dehydrogenase activities were strongly related to O2 uptakes. On an organic C basis, these respiratory activities declined with the depths to which the soils were sampled. Biochemical activities were mostly similar in forest soils derived from basalt and from andesite. Invertase activities were lower in soils under forest than under grassland covers. All biochemical activities were correlated significantly with contents of soil moisture and organic C, less with numbers of aerobic bacteria, and negatively with soil pH. On an organic C basis, none of the biochemical activities was significantly correlated with either soil moisture content or pH.--Copyright 1974, Biological Abstracts, Inc.
W75-08316

MOVEMENT AND PERSISTENCE OF BENSULIDE AND TRIFLURALIN IN IRRIGATED SOIL,
Agricultural Research Service, Weslaco, Tex. Lower Rio Grande Valley Research and Extension Center.
For primary bibliographic entry see Field 5B.
W75-08318

THE INFLUENCE OF SOIL WATER CONTENT ON THE UPTAKE OF IONS BY ROOTS: I. SOIL WATER CONTENT GRADIENTS NEAR A PLANE OF ONION ROOTS,
Nottingham Univ. (England). School of Agriculture.
For primary bibliographic entry see Field 2I.
W75-08330

EXTRACTION OF SOIL SOLUTION FROM FLOODED SOIL USING A POROUS PLASTIC FILTER,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W75-08335

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: II. EFFECT ON CHLOROSIS DEVELOPMENT, AND SOME NUTRIENT ELEMENT CONTENTS IN SOIL AND PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
A. M. Elgala, H. Hamdi, M. Omar, and I. Wafik.
U A R J Soil Sci, Vol 11, No 2, p 259-269, 1971.

Descriptors: Corn, Iron, Phosphorus, Soils, Soil-water-plant relationship, *Calcareous soils, *Irrigation effects.
Identifiers: *Chlorosis, Zea-mays.

In pot experiments using corn (Zea mays single cross 51), attempts were made to evaluate the interaction of iron and phosphorus in soil under high calcium carbonate and various levels of soil moisture in relation to chlorosis development and nutrient balance of growing plants. Four levels of phosphorus; P0, P1, P2 and P3 at a concentration of 0.000, 0.033, 0.066 and 1.132 g P/pot, respectively, were used and 4 levels of Fe; Fe0, Fe3, Fe2 and Fe1 at a concentration of 0, 1, 5 and 10 ppm Fe in the soil, respectively. Three levels of moisture M1, M2, M3 representing the 50%, 100% and 150% of the field capacity, respectively, were applied. The plants were harvested 1 mo. from germination. Available Fe increased by increasing the Fe level, but decreased by increasing the P rate. At any rate of Fe applied, the addition of P decreased Fe in soil. This decrease is more pronounced when Fe was applied at the Fe3 level. With respect to soil moisture, there was a slight increase and a pronounced decrease in the amounts of available Fe under M2 and M3, respectively, as compared to that under M1. Available P in the soil increased by increasing the P rate. The application of Fe had no effect on these values. Increasing soil moisture to the M2 and M3 levels generally increased available P over the M1 level. The combined effect of applied P and moisture on available P was more pronounced than that of P and Fe. Excessive irrigation may indirectly aggravate chlorosis by increasing soluble P or disturb the balance among nutrients in soil and plant.--Copyright 1973, Biological Abstracts, Inc.
W75-08344

RETENTIOS AND RELEASE OF PHOSPHORUS IN CERTAIN CALCAREOUS SOILS OF THE U.A.R. (UNITED ARAB REPUBLIC): I. THE INFLUENCE OF INCUBATION PROCESS AND CYCLES OF WETTING AND DRYING,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 5B.
W75-08350

2H. Lakes

WATER BALANCE OF LAKE KERR--A DEDUCTIVE STUDY OF A LANDLOCKED LAKE IN NORTH-CENTRAL FLORIDA,
Geological Survey, Tallahassee, Fla.
G. H. Hughes.
Florida Bureau of Geology, Tallahassee, Report of Investigations No 73, 1974. 49 p, 18 fig, 6 tab, 11 ref.

Descriptors: *Water balance, *Lakes, *Florida, Evaporation, Hydrologic budget, Inflow, Precipitation(Atmospheric), Runoff, Discharge(Water).
Identifiers: *Lake Kerr(Fla).

Estimates of average yearly lake evaporation were compared with records of pan evaporation and lake-level changes as a basis for making estimates of the importance of various factors in yearly and monthly evaporation from Lake Kerr, Florida. The monthly change in lake level was computed for 1962-69 from estimates of rainfall evaporation, leakage, surface-water and groundwater inflow. Although leakage is known to vary, it was assumed to be constant at 0.1 foot per month. Sur-

face-water and groundwater inflows were estimated as zero, even though they may occur at times. The computed monthly change in level was within 0.10 foot of the observed change in level about 70 percent of the time. Errors substantially greater than 0.10 foot were somewhat erratically distributed in time. Almost all of the large errors indicated inflow not accounted for by the estimates. The absence of pronounced seasonal variation in errors less than 0.10 foot suggested that groundwater inflow played a relatively minor role in the water balance. Variations in leakage and groundwater inflow were accounted for by regression methods relating leakage and groundwater inflow to the difference between the lake stage and the level of water in a well tapping the same aquifer that underlies Lake Kerr. Lake evaporation is estimated to average about 46 inches per year. During 1962-69, leakage from Lake Kerr was about 12 inches greater than groundwater inflow. If this 12-inch difference is representative of the long-term average, surface-water inflow averaging about 4 inches per year is required to maintain the water balance. (Knapp-USGS)
W75-07881

A THEORY OF STEADY WIND-DRIVEN CURRENTS IN SHALLOW WATER WITH VARIABLE EDDY VISCOSITY,
Rochester Univ., N.Y. Dept. of Mechanical and Aerospace Sciences.
J. H. Thomas.
Journal of Physical Oceanography, Vol 5, No 1, p 136-142, January 1975. 6 fig, 2 tab, 8 ref. NSF Grant GA-32209.

Descriptors: *Currents(Water), *Winds, *Shallow water, Model studies, Mathematical models, Basins, Lakes, Lake basins, Water circulation, Limnology, Eddies, Viscosity.

A theory was given for steady wind-driven currents in shallow water (friction depth comparable to total depth) in which the vertical eddy viscosity varies linearly with depth, from zero at the bottom to a maximum at the surface. The theory was presented in a form suitable for numerical computations of currents in real, enclosed basins. The local surface value of the vertical eddy viscosity depends on the surface wind stress, the bottom roughness, and the flow itself; this leads to a quasi-linear equation for the determination of the surface slope or the vertically-integrated mass flux. Results were given for the simple case of a pure drift current in water of uniform depth, and these results were compared with those for a constant vertical eddy viscosity. (Sims-ISWS)
W75-07908

ICE-RAFTED SEDIMENTS AS A CAUSE OF SOME THERMOKARST LAKES IN THE NOATAK RIVER DELTA, ALASKA,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2C.
W75-07948

MORPHOMETRIC CONTROL OF VARIATION IN ANNUAL HEAT BUDGETS,
Monash Univ., Clayton (Australia). Dept. of Zoology.
B. V. Timms.
Limnology and Oceanography, Vol 20, No 2, p 110-112, January 1975. 1 tab, 7 ref.

Descriptors: *Heat budget, *Lake morphometry, *Heat balance, Lakes, Volume, Depth, *Europe, *North America, *Australia, Inflow, Winds, Limnology, Aquatic environment, Water temperature, Physical properties, Hydrology, Hydrologic aspects, Lake morphology, Heat flow, Heat transfer, Melt water.
Identifiers: *Morphometric control.

The extent of variation in annual heat budget of 23 European, North American, and Australian lakes tends to be related to lake volume and mean depth. (Lee-ISWS)
W75-07950

CLADOPHORA DISTRIBUTION IN LAKE ONTARIO (IFYGL),
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5C.
W75-07968

PHOSPHORUS UPTAKE AND RELEASE BY LAKE ONTERIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program; and Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5A.
W75-07972

THE PREDATORY IMPACT OF EEL (ANGUILLA ANGUILLA L.) ON POPULATIONS OF CRAYFISH (ASTACUS ASTACUS L.),
G. Svardson.
Rep Inst Freshwater Res Drottningholm, 52 p, 149-191, 1972. Illus.

Descriptors: *Eels, Fish, Saline water fish, *Crayfish, Crustaceans, *Predation, Aquatic populations, Populations, Lakes, *Fish management, Lakes.
Identifiers: Anguilla-anguilla, Aphanomyces, Astacus-astacus, Eel, Eggs, Management, Pacifastacus-leniusculus, *Sweden, Sympatry.

Eels (Anguilla anguilla) were allowed to penetrate into the lake where they ousted crayfish (Astacus astacus) from the lake and some of its tributaries. There is a general allopatric occurrence of the 2 spp., eel dominating the western part, crayfish the eastern part of southern Sweden. Surveys from some 1600 lakes indicate that the species do have similar habitats; large eutrophic lakes being favored by both. The eel is the tougher of the 2 spp. and may live in all lakes to which it can climb. Crayfish cannot reproduce in summer-cold lakes, although older crayfish may survive and grow in them. When favorable lakes are samples, the sympatric occurrence of the 2 spp. is less frequent than it should be according to chance. The yield tends to be reversed, high eel catches occur in crayfish-free lakes and vice versa. The median annual catch of crayfish is 46 specimens/ha in lakes with no eels and 22 crayfish when eels are present but sparse. Moderate yields of both species thus may be obtained in cases of sympatry but good yields are obtained only when the species are allopatric. A number of case histories are presented where eel and crayfish have fluctuated in reversed direction. Several of the best crayfish producing lakes have had an early history of fewer crayfish and more eels. Crayfish are spontaneous and not introduced in Scandinavia by man. The impact of eel on the crayfish is compared to a number of similar cases where fish interact with crustaceans. The eel's predation on the crayfish gives a survival value to those eel having the best capacity to locate crayfish lakes from a distance. These eel are thereby led to excellent habitats sparsely populated by eel. The crayfish is a delicacy and gives a much higher economic yield/ha. The recent introduction of the Aphanomyces-resistant American crayfish Pacifastacus leniusculus in Swedish lakes has stressed the importance of a new management. Some details on how such management should be outlined are suggested.--Copyright 1974, Biological Abstracts, Inc.
W75-08010

SOME EFFECTS OF EXTENDING THE NAVIGATIONAL SEASON ON THE GREAT LAKES: A NEED FOR CONGRESSIONAL ACTION,
Cleveland State Univ., Ohio. Coll. of Law.
For primary bibliographic entry see Field 6E.
W75-08072

RADIATION INDUCED THERMAL STRATIFICATION IN SURFACE LAYERS OF STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
D. M. Snider, and R. Viskanta.
Journal of Heat Transfer, Paper No 75-HT-CC, 1975, 6 p, 6 fig, 15 ref. OWRT A-029-IND(9).

Descriptors: *Thermal stratification, *Solar Radiation, *Interferometry, *Air-water interfaces, Stratification, Radiation, Heating, Energy transfer, Boundaries.
Identifiers: *Inferogram, *Radiative transfer theory.

Analysis is developed for the time dependent thermal stratification is surface layers of stagnant water by solar radiation. The transient temperature distribution is obtained by solving the one-dimensional equation for combined conduction and radiation energy transfer using a finite difference method. Experimentally, solar heating of water is simulated using tungsten filament lamps in parabolic reflectors of known spectral characteristics. The transient temperature distribution resulting from radiant heating of pure water in a glass-walled test cell is measured with a Mach-Zender interferometer. Measured and predicted temperature profiles show good agreement, thus verifying the radiation and total energy transfer models in stagnant water. The boundary condition of the air-water interface and internal radiant heating rate must be correctly specified in order to properly model stratification of water by radiation.
W75-08098

LIMNOLOGICAL CONDITIONS IN FIVE SMALL OLIGOTROPHIC LAKES IN TERRA NOVA NATIONAL PARK, NEWFOUNDLAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-08131

A COMPARATIVE REVIEW OF PHYTOPLANKTON AND PRIMARY PRODUCTION IN THE LAURENTIAN GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W75-08137

ON THE EFFECTS OF EUTROPHICATION ON LAKE PAIJANNE, CENTRAL FINLAND,
For primary bibliographic entry see Field 5C.
W75-08138

PHYSICAL AND CHEMICAL LIMNOLOGY OF CHAR LAKE, CORNWALLIS ISLAND (75 DEGREES N LAT.),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W75-08143

REVIEW OF GEOLOGICAL RESEARCH AS IT RELATES TO AN UNDERSTANDING OF GREAT LAKES LIMNOLOGY,
Canada Centre for Inland Waters, Burlington (Ontario).
P. G. Sly, and R. L. Thomas.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 795-825, 1974. 14 fig, 5 tab, 108 ref.

Descriptors: *Quaternary period. *Geology, *Great Lakes, *Limnology, Lake sediments, Eutrophication, Lake Erie, Geochemistry, Circulation, Mercury, Water quality, Metals, Trace elements, Carbon, Nitrogen, Phosphorus, Physical properties, Chemical properties, History, Reviews.
Identifiers: Feromanganese concretions.

Geological research, as directed towards Great Lakes studies, has been developed and expanded during the last decade, nurtured by various factors, notably the impact of increased eutrophication in Lake Erie, the impact of sublethal but toxic contaminants in restricted areas, periods of extreme water level fluctuation, and a greatly increased demand for high quality water for multiple uses. A review of studies on the geology of recent sediment deposits in the Great Lakes is presented. A summary of quaternary events and a cross-correlation between each of the major basins has been attempted; in this respect it is esential to realize the control imposed upon present depositional conditions by the preceding sedimentary environments (often related to significantly different lake levels). Sediment/energy relations have been discussed, particularly in the context of large lake limnology. Geochemical topics include major and trace metal data, formation of ferromanganese deposits, and major nutrients (C, N, and P). Published material covering these topics is, however, rather limited. Throughout this review attempt has been made to show the interrelations between geological evidence and physical, chemical, and biological processes and the application of such information to human oriented problems. (Jones-Wisconsin)
W75-08144

A REVIEW OF RESEARCH ON THE LIMNOLOGY OF WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-08145

OXYGENATION OF LAKE HYPOLIMNIA,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W75-08194

FISH PREDATION EFFECTS ON THE SPECIES COMPOSITION OF THE ZOOPLANKTON COMMUNITY IN EIGHT SMALL FOREST LAKES,
Goteborg Univ. (Sweden). Inst. of Zoology.
J. A. E. Stenson.
Rep Inst Freshwater Res Drottningholm. 52. p 132-148, 1972, Illus.

Descriptors: *Lakes, Europe, *Fish, *Predation, Zooplankton, *Rotenone, Fish control agents.
Identifiers: Bosmina-coregoni, Bosmina-longirostris, Bythatrephes-longimanus, Cladoceran, Daphnia-cristata, Daphnia-longispina, *Sweden(Bohuslan).

The effects of size dependent predation on the crustacean plankton fauna of 8 small forest lakes in the province of Bohuslan, S. W. Sweden were investigated. Four lakes were treated with rotenone. Three of these lakes were restocked with new fish species, the 4th was reoccupied by the original species. The physico-chemical limnology conditions were similar throughout the year and differences in the sediment composition and vegetation were very small. The lake treated with rotenone but containing the original fish fauna had the same zooplankton species composition as the untreated lakes. In the lakes with low predation intensity (i.e. those with the new fish species), the larger zooplankton species Bythotrephes longimanus and Daphnia longispina were present. These species were eliminated in the lakes with high predation intensity and D. longispina was replaced by the smaller D. cristata. A clear difference in the size distribution of the cladoceran community, between the lakes with high predation intensity (those with the original fish species) and the lakes with low predation intensity is demonstrated. The larger Bosmina coregoni replaced the smaller B. longirostris when predation intensity decreased.--Copyright 1974, Biological Abstracts, Inc.
W75-08220

TEMPERATURE EFFECTS ON GREAT LAKES WATER BALANCE STUDIES,
Illinois Univ., Urbana. Water Resources Center.
D. D. Meredith.
Water Resources Bulletin, Vol 11, No 1, p 60-68, February 1975. 2 tab, 26 ref. OWRT B-062-ILL(3). 14-31-0001-3580.

Descriptors: *Great Lakes, Hydrology, *Water balance, *Water temperature, Lakes, Monthly, Water supply, Water levels, Thermal expansion.
Identifiers: Basin supply values, Thermal contraction.

Beginning of month water temperature profiles are estimated for each lake. These water temperature profiles along with surface water temperatures are used to determine the effects of thermal expansion and contraction of water on the net basin supply values obtained from water balance studies using end of month lake levels. Net basin supply values (equivalent to precipitation on the lake minus the evaporation from the lake plus the runoff into the lake) obtained from water balance studies without accounting for the thermal expansion and contraction of water may be in error by as much as 100 percent during some months for each lake.
W75-08225

THE EPIDEMIOLOGY OF PARASITIC DISEASES FROM AKOSOMBO LAKE (GHANA) AND NASSER LAKE (SUDAN EGYPTIAN NUBIA), (IN FRENCH),
Institut Pasteur, Paris (France). Laboratoire d'Epidemiologie.
For primary bibliographic entry see Field 5C.
W75-08226

STUDIES ON THE EFFECTIVE STOCKING OF SALMONID FISH: II. ACTIVITY OF DOWN MIGRATION OF HIMEMASU, ONCORHYNCHUS NERKA, SOON AFTER STOCKING WITH SPECIAL REFERENCE TO THE FACTORS OF THEIR MIGRATION, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
Y. Shiraishi, and T. Shimada.
Bull Freshwater Fish Res Lab Tokyo, Vol 22, No 1, p 1-12, Illus, 1972. English summary.

Descriptors: *Fish migration, *Fish stocking, Salmon, Fry, *Salmonids.
Identifiers: Oncorhynchus, *Japan(Lake Chuzenji).

Down migration of the young fish of O. nerka was studied in Lake Chuzenji, Lake Yunoko (Japan) and in a rearing pond. The down migration soon after they are released is clearly different from the seaward migration of the smolt stage. In the Lake Chuzenji, fry of 0.5 g body weight were released on 1 June, 1964 at the inlet of the Lake, and traced for 2 wk. They migrated westward and eastward along the coast. The speed of the fish school in the 2 directions was very different, about 400 m/day in eastward and about 1000 m/day in westward migration. In Lake Yunoko 100,000 fry were released on 1 July, 1974 at the northern part of the lake; the fish migrating out of the lake were checked by a small net at the debouchment of the lake. On the 2nd day after they were released, a maximum number (228 fry) was trapped. After that day the fry trapped decreased daily; only 18 were trapped after a week. About 1% of total fish stocked migrated from the lake during 2 wk after they were released. The same tendency was seen in the case of the rearing pond where 50,000 fry were stocked; the number of fish migrating out of the pond at the outlet was checked. Activity of fish was accelerated at dawn and at twilight, when the light intensity changed. Migration from an experimental trough continued longer when the trough was covered with black vinyl sheet. Turbidity of water accerated the activity of down migration and the larger the fish, the lower the activity of migration. Migration was not altered by placing stones and algae in the trough. The activity of down migration was accelerated by adding some predators (O. masou) of 30 g in body weight. When O. nerka, the same species, was added, no effect was seen in the activity of down migration of the fry. (See also W75-07621)--Copyright 1973, Biological Abstracts, Inc.
W75-08237

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: VI. MORPHOMETRICAL COMPARISON OF THE COMMON CARP CULTURED IN RUNNING WATER POND, IRRIGATION POND AND FLOATING CAGE, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 8I.
W75-08240

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
V. Hruska.
Hydrobiol Stud, 2, p 213-247, 1973, Illus.

Descriptors: *Reservoirs, *Benthos, *Europe, Oligochaetes, Diptera, *Biomass, Tubificids, Benthic fauna.
Identifiers: Chironomidae, *Czechoslovakia(Slapy reservoir), Ekman-Birge, Slapy.

The abundance and biomass were observed on 2 transects 9 km and 33km above Slapy dam(Czechoslovakia). Additional samples were taken 35 km above the dam. Experiments with the protection of 4 m2 areas of bottom against fish feeding activity were arranged on the transect of 9 km. Samples (218) were taken with the modified Ekman-Birge bottom sampler (area 225 cm2). The benthos in 1960 was quantitatively richest in the profundal of both transects (30 and 10 m, respectively). Oligochaeta were the most important components. The time of the maximal quantity of benthos at both localities differed greatly. The quantity of benthos in the littoral and the sublittoral of both transects was low. The major components were Oligochaeta and Chironomidae. In the year 1961 with the retention of river tripton in the upper Orlik Reservoir the huge quantities of Oligochaeta disappeared from the transect at 33 km. On the transect at 9 km there was a slight decrease of average biomass. The lower profundal (40 m) became quantitatively the richest zone and the changes of abundance and biomass differed from those in the preceeding year. As concerns the number of cocoons of Tubificidae in 1960 both transects revealed similar differences in the abundance and biomass of worms. In 1961 the laying of cocoons almost ceased at the 33 km transect and was greatly reduced at 9 km. The protection of 4-m2 bottom areas against fish feeding activity indicates that the differences between the quantitatively poor benthos in the littoral and sublittoral and rich benthos in the profundal must be ascribed to the better food conditions here rather than to fish feeding activity in the littoral and sublittoral. The percentage frequency for animals found in both transects is given. At 9 km, the qualitatively richest chironomid fauna was found in the littoral. The permanent fauna was qualitatively richest in

the upper and middle profundal. At 33 km, such apparent differences were not observed.--Copyright 1974, Biological Abstracts, Inc.
W75-08246

BIOLOGY AND MANAGEMENT OF SMALLMOUTH BASS IN ONEIDA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
J. L. Forney.
N Y Fish Game J, Vol 19, No 2, p 132-154, 1972, Illus.
Identifiers: Age, Bass, Biology, Growth rates, Lakes, Management, *New York(Oneida Lake), Regulation, Smallmouth bass, Fish stocking, Temperature.

Age composition and growth rate of smallmouth bass (Micropterus dolomieui) in Oneida Lake, New York were determined from scales and measurements collected from 1952-1970. Dominant year classes were produced in years when mean June air temperatures were above normal. The catch of young bass in seine hauls indicated that year-class size was established by Aug., but the causal relation between June air temperature and year-class survival was not established. The long-term average growth rate of bass was stable between 1949 and 1966, but annual growth increments varied markedly. Much of this variation was attributable to differences in mean summer air temperatures and the abundance of young yellow perch which were an important forage species. Annual survival and minimum rates of exploitation were determined from tag returns reported by anglers. The mean annual survival during a 14-yr period was 0.57 which agreed closely with estimates from catch curves. A linear regression was fitted to annual survival rates and minimum rates of exploitation to obtain an estimate of natural mortality. The intercept in the event of no fishing corresponded to a natural mortality rate of 0.125. The role of regulations and stocking in the management of the population is examined.--Copyright 1973, Biological Abstracts, Inc.
W75-08250

CHARACTERISTICS OF A SMALL-LAKE FISHERY AS DETERMINED BY A CREEL CENSUS,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
D. M. Green.
N Y Fish Game J, Vol 19, No 2, p 155-167, 1972. Illus.
Identifiers: *Creel census, Esox-niger, *Fisheries, Ictalurus-nebulosus, Lakes, Lepomis-gibbosus, Micropterus-salmoides, *New York, Perca-flavescens, Pomoxis-nigromaculatus, Fishing.

A creel census was conducted on a shallow 117.5-acre warm-water lake in central New York from June 1965-March 1968. Species recorded in the anglers' catch were: largemouth bass, chain pickerel, brown bullhead, yellow perch, pumpkinseed and black crappie (Micropterus salmoides, Esox niger, Ictalurus nebulosus, Perca flavescens, Lepomis gibbosus Pomoxis nigromaculatus. Catch and effort were estmated for shore, boat and ice fishermen. Effort ranged from 6887-11,874 man hours, with shore fishermen expending the greatest effort and ice fishermen the least. Monthly and daily distributions of effort was determined. Bullheads, pumpkinseeds and perch were the fish most frequently caught by shore fishermen, while pumpkinseeds, pickerel and perch sustained the boat fishermen. Boat fishermen caught over 80% of the bass taken. Perch were numerically the most important fish in the catch and comprised the bulk of the ice fishermen's catch. Ice fishermen also took a significant number of pickerel. Fish caught and released may be important in evaluating the quality of such a fishery.--Copyright 1973, Biological Abstracts, Inc.
W75-08251

DISTRIBUTION OF WALLEYE AND YELLOW PERCH FRY IN A BAY OF ONEIDA LAKE,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
R. L. Noble.
NY Fish Game J, Vol 19, No 2, p 168-177, 1972. Illus.
Identifiers: Bays, *Distribution, Fry, Lakes, *New York(Oneida Lake), Perca-flavescens, *Perch, Stizostedion-vitreum-vitreum, Walleye perch, Yellow perch.

Densities of walleye (Stizostedion vitreum vitreum) and yellow perch (Perca flavescens) fry were usually greater inshore than offshore in samples taken during early June. Walleye fry concentrated at a variable depth, whereas yellow perch fry were uniformly distributed to a depth of 3.7 m except during calm weather. Although vertical and horizontal distributions of the 2 spp. did not coincide, catches were correlated within localized areas. Correlations between the abundance of yellow perch fry and their occurrence in walleye fry stomachs indicated that the association between the 2 spp. may have been caused by a predator-prey relationship. The over-all difference in distribution indicated that perch abundance was not the major influence on the distribution of walleye fry.--Copyright 1973, Biological Abstracts, Inc.
W75-08252

A RESURVEY OF THE FISH PARASITES OF WESTERN LAKE ERIE,
R. V. Bangham.
Bull Ohio Biol Surv, Vol 4, No 2, p 1-23, 1972.
Identifiers: *Lake Erie, Clinostomum-marginatum, Diplostomulum-flexicaudum, Eustrongylides-sp, *Fish parasites, Ichthyophthirius-multifiliis, Lakes, Philometra-cylindracea, Posthodiplostomum-mimimum, Proteocephalus-ambloplitis, Survey.

Parasites from fish collected from the west end of Lake Erie were identified and compared with the results of a similar study made during 1927-29 (published in 1939). In the present study 1687 fish belonging to 66 spp. were examined in 1957 of which 1589 or 94.2% were parasitized. The 1939 report cited 58.3% parasitized. No lake herring or whitefish were taken and fewer specimens of blue pike, sauger, and burbot were available in 1957, but bullheads, carp, white bass, rock bass, crappies, sunfish, bluegill and sheepshead were more readily available. Parasites (110 spp.) were encountered, including the following of economic importance: Ichthyophthirius multifiliis, Clinostomum marginatum, Diplostomulum flexicaudum, Posthodiplostomum mimimum, Proteocephalus ambloplitis, Eustrongylides sp., and Philometra cylindracea. Tables of all parasites found, as well as a comparison of the 1939 and 1957 surveys, are given.--Copyright 1973, Biological Abstracts, Inc.
W75-08253

SOME PHYSICOCHEMICAL FEATURES OF A MEROMICTIC LAKE SUIGETSU,
Nagoya Univ. (Japan). Water Research Lab.
M. Matsuyama.
J Oceanogr Soc Jap, Vol 29, No 2, p 47-52, 1973, Illus.

Descriptors: *Lakes, Meromixis, *Chemical analysis, Water temperature, *Thermal stratification, Stratification.
Identifiers: Chemocline, *Chlorinity, *Japan(Lake Suigetsu), *Meromictic lakes, Suigetsu.

Vertical distributions of temperature and chlorinity show that the lake is well stratified and no marked mixing occurs between the upper fresh water and lower salt water. In the chemocline, the vertical gradient of density is large and the vertical eddy diffusion coefficient is as low as 1.5 x 10-2 cm2 sec.-1. Dissolved O2 saturated near the surface and rapidly decreases with depth towards the chemocline, where sulfide first appears and increases towards the bottom. In the chemocline O2 comsumption is a prominent process, reaching 290 mg O2/m2/day. The oxidation of sulfide, supplied from the underlying water layer, is the main factor causing O2 consumption in the chemocline.--Copyright 1974, Biological Abstracts, Inc.
W75-08255

ORGANIC SUBSTANCES IN SEDIMENT AND SETTLING MATTER DURING SPRING IN A MEROMICTIC LAKE SUIGETSU,
Nagoya Univ. (Japan). Water Research Lab.
M. Matsuyama.
J Oceanogr Soc Jap, Vol 29, No 2, p 53-60, 1973. Illus.

Descriptors: Asia, *Lakes, *Sediment sorting, *Sediment distribution, Meromixis, Sampling.
Identifiers: *Japan(Lake Suigetsu), *Meromictic lake, Suigetsu.

Vertical distribution of organic substances of settling matter and sediments was measured in a meromictic lake, Lake Suigetsu (Japan). Proteinaceous materials were rapidly eliminated in the early stage of settling. There was no major difference in amino acid composition of the hydrolysates of all samples, indicating that no selective decomposition of amino acids had occurred. In contrast, the decomposition of carbohydrates was sluggish. Water extractable carbohydrates were abundant in the sediments. Dissolved carbohydrates and amino acids formed in the sediments, were partly metabolized by photosynthetic sulfur bacteria, Chromatium sp. in the chemocline.--Copyright 1974, Biological Abstracts, Inc.
W75-08257

OLIGOTROPHICATION: A SELF-ACCELERATING PROCESS IN LAKES SUBJECTED TO EXCESSIVE SUPPLY OF ACID SUBSTANCES,
Institue for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5C.
W75-08262

RATES OF OXYGEN UPTAKE BY THE PLANKTONIC COMMUNITY OF A SHALLOW EQUATORIAL LAKE (LAKE GEORGE, UGANDA),
Vienna Univ. (Austria). Limnologische Lehrkanzel.
For primary bibliographic entry see Field 5C.
W75-08263

COMMUNITIES OF OLIGOCHAETA AS INDICATORS OF THE WATER QUALITY IN LAKE HJALMAREN,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5B.
W75-08267

POTENTIAL LANDSLIDE-GENERATED WATER WAVES, LIBBY DAM AND LAKE KOOCANUSA, MONTANA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08291

RICHARD B. RUSSELL LAKE WATER QUALITY INVESTIGATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08293

ICHTHYOFAUNA OF THE TYSMIENICA AND WLODAWKA RIVER BASINS, (IN POLISH),
Akademia Wychowania Fizycznego, Warsaw (Poland). Zaklad Nauk Biomedycznej.
Z. Danilkiewicz.
Fragm Faun (Warsaw), Vol 19, No 7, p 121-147, 1973. Illus.

Descriptors: Basins, *Lake basins, *River basins, Freshwater fish, Carp, Pike, Roach, Perches, *Populations, Rivers, Lakes, Europe, *Fish populations.
Identifiers: Carassius-auratus-bibelio, Coregonus-albula, Crucian carp, Ctenopharynogodon-idella, Ictalurus-nebulosus, Pike, *Poland, Roach, Tysmienica River, Wlodawka River, Domarzno Lake.

Freshwater fish (34 spp.) were identified in the water of the Tysmienica and Wlodawka river basins in Poland, the most common and numerous being pike, crucian carp, roach and perch. The largest number of species, 31 was found in the Tysmienica River. Of the lakes, Lake Domarzno was the richest with 23 spp., followed by Lake Biale Sosnowickie with 22 and Lake Biale Wlodawskie with 21. Coregonus albula, Carassius auratus gibelio, Ctenopharyngodon idella and Ictalurus nebulosus are fairly new in these waters. Attention is called to the damaging effect on the ichthyofauna and the environment of the region by hydrotechnical works being carried out here, and as the construction of the Wieprz-Krzna Canal. Distribution of fish in the various types of water bodies is presented in tabular form.--Copyright 1974, Biological Abstracts, Inc.
W75-08310

MUD-WATER EXCHANGE OF PHOSPHATE AND OTHER IONS IN UNDISTURBED SEDIMENT CORES AND FACTORS AFFECTING THE EXCHANGE RATES,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 2J.
W75-08320

THE CHEMICAL ECOLOGY OF COPEPOD DISTRIBUTION IN THE LAKES OF EAST AND CENTRAL AFRICA,
Duke Univ., Durham, N.C. Dept. of Zoology.
M. C. Labarbera, and P. Kilham.
Limnol Oceanogr, Vol 19, No 3, p 459-465, 1974, Illus.
Identifiers: *Africa, Chemical studies, Conductivity, *Copepod distribution, Ecology, Epilimnion, *Lakes, Range.

The copepods in plankton samples from 48 lakes in East and Central Africa were identified and the conductivity (k20) of the epilimnion of each lake was determined. A range, mean, and standard deviation were calculated for the conductivity of the waters in which each copepod species was found. There appears to be a definite range of conductivities in which each species can maintain a viable population.--Copyright 1974, Biological Abstracts, Inc.
W75-08321

STRATIGRAPHIC EFFECTS OF TUBIFICIDS IN PROFUNDAL LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W75-08322

AGE, GROWTH, LENGTH-WEIGHT RELATIONSHIP, SEX RATIO AND FOOD HABITS OF THE ARGENTINE PEJERREY, BASILICHTHYS BONARIENSIS (CUV. AND VAL.), FROM LAKE PENUELAS, VALPARAISO, CHILE,
Universidad Catolica de Valparaiso (Chile). Laboratorio de Hidrobiologia Aplicadas.
R. G. Burbidge, M. C. Carrasco, and P. A. Brown.
J Fish Biol, Vol 6, No 3, p 299-305, 1974, Illus.
Identifiers: Age, *Argentina Pejerreys, Basilichthys-bonariensis, Bosmina-sp, *Chile(Lake Penuelas), Cladoceran, Copepods, Diaphanosoma-brachyurum, Diptera, Feeding, Food, Growth, Lakes, Length, Light, Ostracod, Sex, Simocephalus-serrulatus, Weight.

Argentine pejerreys were collected in Lake Penuelas during Jan. 1973. Calculated growth rate was maximum during the 3rd year of life. The length-weight relationship was: log W = -5.69395 + 3.25248 log L, where W = weight (g), and L = total length (mm). Age-group I was sexually mature. The sex ratio was 85 males (54%) to 73 females (46%). Young-of-the-year pejerreys fed primarily on copepods, but cladocerans (Bosmina sp., Diaphanosoma brachyurum, Simocephalus serrulatus, ostracods, and dipterans were also respresented. Feeding occurred during daylight.--Copyright 1974, Biological Abstracts, Inc.
W75-08326

SPECIES INTRODUCTION IN A TROPICAL LAKE,
Washington Univ., Seattle. Dept. of Zoology.
T. M. Zaret, and R. T. Paine.
Science, Vol 182, No 4111, p 449-455, 1973. Illus.

Descriptors: Lakes, Fish, *Predation, *Zooplankton.
Identifiers: Ceriodaphnia, Cichla, Melaniris, *Panama Canal Zone, *Gatun Lake, Lake ecosystem, *Tropical lakes.

Probably in early 1967, a piscivore from South America, Cichla ocellaris, was introduced to Gatun Lake in the Panama Canal Zone. As this predator population spread through the lake, the initial effect was dramatic reductions in almost all secondary consumers. These species reductions produced, in turn, 2nd- and 3rd-order changes at other trophic levels of the ecosystem. The resulting changes in the lake community can be seen best by examining the general Gatun Lake food web. The decrease in numbers of the important planktivore Melaniris has resulted in changes within the zooplankton community, as illustrated by the cladoceran Ceriodaphnia. The tertiary-consumer populations, such as tarpon, black terns, kingfishers and herons, formerly dependent on small fishes for food, appear less frequently in the Cichla areas of the lake. There has also been, possibly, a resurgence of the local mosquito populations (which are malaria vectors), caused by the reduction in the populations of insect-eating fishes. Even the primary producers may be affected by this introduction. Although at present the Gatun Lake ecosystem is undergoing rapid changes, an eventual return to some form of equilibrium is anticipated. However, it will be some time before the permanence or transience of the many changes produced in the trophic levels by the introduction of a single, top level predator to this lake system can be evaluated.--Copyright 1974, Biological Abstracts, Inc.
W75-08345

2I. Water In Plants

UTILITY OF BROWN COAL FROM TUROW AND KONIN MINES AS THE SEEDBED IN HYDROPONIC CULTURES, (IN POLISH),
Wroclaw Univ. (Poland). Inst. of Botany and Biochemistry.
For primary bibliographic entry see Field 3F.
W75-07853

FINITE ELEMENT ANALYSIS OF TWO-DIMENSIONAL FLOW IN SOILS CONSIDERING WATER UPTAKE BY ROOTS: I. THEORY,
Agricultural Research Organization, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W75-07941

FINITE ELEMENT ANALYSIS OF TWO-DIMENSIONAL FLOW IN SOILS CONSIDERING WATER UPTAKE BY ROOTS: II. FIELD APPLICATIONS,
Institute for Land and Water Management Research, Wageningen (Netherlands).
For primary bibliographic entry see Field 2G.
W75-07942

EFFECT OF INTERACTION OF FACTORS ON WILT OF CORIANDER CAUSED BY FUSARIUM OXYSPORUM SCHLECHT EX. FR. F. CORIANDERII KULKARNI, NIKAN ET JOSHI,
Rajasthan Agriculture Dept., Kota (India).
U. S. Srivastava.
Indian J Agric Sci. Vol 42, No 7, p 618-621, 1972.
Identifiers: *Coriander, Coriandrum-sativum, Fusarium-oxysporum-f-corianderii, Manure, Organic matter, Soils, *Wilt, Hydrogen ion concentration, *Soil temperature, *Soil moisture, *Soil pH, *Soil treatments.

In a set of 3 treatments, interaction was studied among soil temperature (20 and 28C), soil moisture (35 and 69% moisture-holding capacity), soil pH (6.0 and 8.2), organic manure (oilcake in 0 and 200 ratios) and 16 varieties of coriander (Coriandrum sativum L.) for the effect on wilt mortality caused by F. oxysporum corianderii. In the treatment without oilcake, the disease was severe (100%) at a pot temperature of 28C and pH of 6.0 in soil-temperature tanks. With the addition of oilcake and increase in pH to 8.2 the mortality was reduced by 50%. A combination of high soil moisture (69% moisture-holding capacity without oilcake) and pH of 6.0 caused 100% mortality, whereas 35% moisture-holding capacity with oilcake and pH of 8.2 reduced the mortality to 28.6%. None of the varieties proved resistant at 28C; however, 'MP 5365' was found wilt-tolerant (30% mortality). In all the varieties, wilt was much less at 20 than at 28C.--Copyright 1973, Biological Abstracts, Inc.
W75-07983

PHYSIOLOGICAL APPROACH TO THE ANALYSIS OF SOME COMPLEX CHARACTERS OF POTATOES,
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
For primary bibliographic entry see Field 3F.
W75-08008

ROOT MASS ESTIMATION IN LOWLAND TROPICAL RAIN FORESTS OF CENTRAL ANAZONIA, BRAZIL: I. FINE ROOT MASSES OF PALE YELLOW LATOSOL AND A GIANT HUMUS PODZOL,
Max-Planck-Institut fuer Limnologie zu Ploen (West Germany). Dept. of Tropical Ecology.
H. Klinge.
Trop Ecol, Vol 14, No 1, p 29-38, 1973.
Identifiers: *Brazil(Amazonas), Forests, *Giant humus, Lowlands, Podzol, *Root mass estimation, Soils, Tropical, *Yellow latosol, Heath forests, Rain forests.

A latosol under terra firma rain forest and a giant humus podzol under heath forest (campina) were studied near Manaus, State of Amazonas, Brazil, with regard to fine root development. Both soils differ in total living biomass above the soil surface and nutrient status as well as in total fine root mass. They show a clear tendency of having greater amounts of finer roots in the organic surface layers. Eighty percent of total fine root mass of the podzol are in its raw humus layer, and 25% of total fine root mass was found in the litter layer of the latosol.--Copyright 1974, Biological Abstracts, Inc.
W75-08076

ON VERTICAL STRATIFICATION IN CERTAIN HYDROPHYTES,
Banaras Hindu Univ., Varanasi (India). Dept. of Botany.
K. Ram.
Trop Ecol, Vol 14, No 1, p 76-80, 1973, Illus.
Identifiers: Buoyancy, *Hydrophytes, *Specific gravity, *Vertical stratification, Aquatic plants.

Specific gravity of freshwater plants ranges from 0.17-0.9, with the exception in some plant parts (seeds, rhizomes and corms). Vertical position (buoyancy) has significant inverse correlation with specific gravity. Vertical position (buoyancy) has positive correlation with volume/weight(V/W) ratio.--Copyright 1974, Biological Abstracts, Inc.
W75-08083

SILICON DEPLETIONS IN SOME NORFOLK RIVERS,
Yorkshire River Authority, Leeds (England). Pollution Prevention Dept.
For primary bibliographic entry see Field 5C.
W75-08106

GERMINATION AND SEEDLING VIGOR OF SIX RANGE SPECIES IN RELATION TO MOISTURE STRESS AND TEMPERATURE,
Cairo Univ., Giza (Egypt). Dept. of Agronomy.
For primary bibliographic entry see Field 3B.
W75-08111

DESERT FARMERS: ANCIENT AND MODERN,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
For primary bibliographic entry see Field 3F.
W75-08113

MAIN DEMOGRAPHIC FEATURES OBSERVED ON 50 FRENCH TROUT RIVERS: INFLUENCE OF SLOPE AND CALCIUM, (IN FRENCH),
Station d'Hydrobiologie Continentale, Biarritz (France).
R. Cuinat.
Ann Hydrobiol, Vol 2, No 2, p 187-207, Illus, 1971.

Descriptors: Europe, *Trout, *Fish populations, Aquatic populations, Statistical methods, *Mathematical studies, Rivers, *Calcium, Oxygen, *Slopes.
Identifiers: Demographic studies(Fish), *France.

Demographic data collected from 1959-1969 in 4 districts of France (Normandie, Nord-Est, Massif-central, Pyrenees-Atlantiques) were studied. A statistical study of the main demographic parameters was done. For every parameter, variation coefficients show the large diversity of trout populations. However, a large part of the variance is statistically explainable by both variables, slope and Ca. For the slope, Huet's law is confirmed by observations, with the following 2 restrictions; trout zone appears to spread onto the slope 4/1000, instead of 7/1000 (for 10 m width) and rivers studied in Normandie, although their slope is under 1.5/1000, have important trout populations. Factors other than slope (in particular temperature and O2) are also important. Ca content, expressed with a logarithmic scale, has a positive linear correlation with fish growth in length.--Copyright 1974, Biological Abstracts, Inc.
W75-08170

THE PROTECTIVE EFFECT OF SUGARS ON CHLOROPLAST MEMBRANES DURING TEMPERATURE AND WATER STRESS AND ITS RELATIONSHIP TO FROST, DESICCATION AND HEAT RESISTANCE,
Duesseldorf Univ. (West Germany). Botanical Inst.
For primary bibliographic entry see Field 3F.
W75-08242

MOISTURE MODIFICATION SHELTERS FOR EPIDEMIOLOGICAL STUDIES OF FOLIAR DISEASES,
Georgia Univ., Athen.
J. T. Reid, D. H. Smith, J. E. Hughes, and F. L. Crosby.
Plant Dis Rep, Vol 57, No 4, p 329-332, 1973, Illus.
Identifiers: *Dew, Epidemiological studies, *Foliar diseases, Moisture, *Peanut leafspot, Rain, Plant diseases, *Moisture modification shelters.

Three automatically controlled movable shelters were designed, constructed and evaluated under field conditions in a study of the effect of dew and rain on the development of peanut leafspot epidemics. The moisture modification system described, however, also can be utilized for epidemiological studies of foliar diseases in other crops. The shelters were constructed of wood-frames and covered with clear plastic film. The moving mechanism for each shelter consisted of a cable and drum, driven by a reversible electric gear motor. A moisture sensor circuit was employed to detect the onset of rainfall. The rapid response of the 'no rain' shelters prevented the accumulation of free water on plant surfaces by moving them to the 'covered plot' position within 20-40 sec after the onset of rainfall. A 24-hr time clock and the moisture sensor circuit controlled the movement of the 3 shelters to obtain the following test conditions: 'no dew', 'no dew-no rain', and 'no rain'. The system performed very satisfactorily under field conditions during 1970, 1971, and 1972.--Copyright 1973, Biological Abstracts, Inc.
W75-08245

ON THE DOWNWARD MOVEMENT OF CREOSOTE IN EUCALYPTUS POLES,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Forest Products Lab.
R. Johanson.
Holzforschung, Vol 27, No 1, p 7-11, 1973, Illus.

Descriptors: *Wood preservative, *Creasote, *Eucalyptus, Fungi.
Identifiers: Transmission poles.

The downward movement under gravity of high temperature creosote was studied in sapwood of pressure impregnated eucalyptus round timers about 150 mm diameter and 2.4 m long, some of which were sealed in loosely fitted polythene tubing and others exposed without cover, and all held vertically with the butt-end down at 45C. In both E. cypellocarpa and E. obliqua the initial movement rate was similar in sealed and uncovered rounds. In some, retentions decreased within 3 mo. by more than 50% at the top of the rounds revealing a very low capacity of sapwood to hold creosote. The forces producing downward movement may contribute to the total loss of creosote in various parts of transmission poles in service. The depleted sapwood may become more susceptible to entry by fungi, through checks and cracks, into the nondurable heartwood which is resistant to pressure impregnation and which is dependent for its protection on the treated sapwood.--Copyright 1973, Biological Abstracts, Inc.
W75-08247

COMPARISON OF INTERMITTENT AND PERMANENT STREAMS OF CALCAREOUS PROVENCE, (IN FRENCH),
Aix-Marseille-1 Univ. (France). Lab. for Animal Biology-Ecology.
For primary bibliographic entry see Field 2E.
W75-08261

COMPONENTS ANALYSIS OF YIELD RESPONSES TO DROUGHT OF SORGHUM HYBRIDS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 3F.
W75-08265

THE EFFECT OF SOIL MOISTURE TENSION AND NITROGEN SUPPLY ON NITRATE REDUCTION AND ACCUMULATION IN WHEAT SEEDLINGS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 3F.
W75-08266

PRODUCTIVITY OF THE WATER-CONSUMPTION OF TREES, (IN GERMAN),
H. J. Braun, and P. Schmidt.
Z Pflanzenphysiol, Vol 70, No 3, p 270-275, 1973. Illus.

Descriptors: *Trees, *Water utilization, Water requirements, Measurement.

A method has been described to measure immediately and exactly the water-consumption of trees by Braun and Schmidt. To show the possibilities of this method, some results are published. The concepts 'Productivity of water consumption' and 'Coefficient of water consumption' are introduced.--Copyright 1974, Biological Abstracts, Inc.
W75-08268

CHANGE OF FEEDING OF THE GROUSE UNDER THE EFFECT OF DRAINAGE RECLAMATION, (IN RUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
V. B. Vadkovskii.
Vyesti Akad Navuk B SSR Syer Biyal Navuk, 3 p, 122-123, 1973.

Descriptors: *Birds, Game birds, Land reclamation, Reclaimed water, *Food habits, Feeds, Pollution, Pollutants, Water pollution sources, *Diets.
Identifiers: Barley, Cottongrass, Cowberry, Cranberry, *Feeding, Fireweed, *Grouse, Hawkweed, Oats, Pine, Speedwell, *USSR(Belorussia), Wheat.

An analysis of 31 food samples and 20 fecal specimens on the feeding of grouse in Belorussia (USSR) is presented. A narrow range of food (cranberry, cottongrass inflorescences, pine needles, cowberry leaves) was characteristic for the population inhabiting an unreclaimed territory. In the case of reclamation there was a considerable change of the range of food of the birds (dock, wheat, oat, barley, hawkweed, speedwell, fireweed, etc.) toward a better food supply. Different food spectra of grouse populations living under different ecological conditions are indicated. The grouse gradually adjust to the cultivated landscape on drained territories.--Copyright 1974, Biological Abstracts, Inc.
W75-08269

OPTIMUM LEVEL OF PROTEIN IN PURIFIED DIET FOR EEL, ANGUILLA JAPONICA,
Freshwater Fish Research Lab., Tokyo (Japan).
T. Nose, and S. Arai.
Bull Freshwater Fish Res Lab Tokyo, Vol 22, No 2, p 145-155, 1972. Illus.

Descriptors: *Eels, *Diets, Proteins, Fish, *Fish diets, Freshwater fish, Testing.
Identifiers: Anguilla-japonica, Casein, Cellulose, Dextrin, Glycogen, Corn oil, Vitamins, Japan.

The protein requirement of the eel, Anguilla japonica, was studied by using a purified diet consisting of casein, dextrin, cellulose powder, vitamin mixture, mineral mixture, carboxymethylcellulose (CMC), corn oil and cod liver oil. Casein was replaced by dextrin in order to provide the different levels of protein in the diet. Thirty-five well trained eels were grouped for each diet and raised in a small aquarium at 25C. The experiment was continued for 8 wk. Body weight gain and accumulation of body protein were both linearly related to

the protein level in diet within the range of 0 approximately 44.5%, beyond which both factors were constant or decreased. Eels seem to require about 45% protein in their diet for maximum growth at 25C. A low protein and high carbohydrate diet caused accumulation of body fat and high glycogen in the liver, resulting in its enlargement. The composition of fatty acids in the body fat was slightly influenced by the levels of protein and carbohydrate in diet.--Copyright 1974, Biological Abstracts, Inc.
W75-08270

ANNOTATED CHECK-LIST OF VASCULAR PLANTS OF SAGEHEN CREEK DRAINAGE BASIN, NEVADA COUNTY, CALIFORNIA,
California State Univ., San Jose. Dept. of Biological Sciences.
W. Savage.
Madrono, Vol 22, No 3, p 115-139, 1973, Illus.
Identifiers: *California(Sagehen Creek), Creeks, Drainage basins, Habitats, *Vascular plants, Sierra Nevada.

An inventory of the vascular plants of a valley in the northern Sierra Nevada was undertaken to establish a basis for comparison with other localities with a similar environment. The catalog of plants, which was compiled, includes 438 taxa, representing 217 genera and 60 families. The study area, at an elevation of approximately 2000 m, is 4.8 km by 8.9 km in size. The habitats include stream banks, bogs and wet and dry meadows interspersed among mixed coniferous forest associations. The climatic and geologic factors affecting the habitats are also discussed.--Copyright 1973, Biological Abstracts, Inc.
W75-08277

THE ANCIENT NAMIB DESERT,
For primary bibliographic entry see Field 2A.
W75-08288

GROWTH, WATER AND NUTRIENT STATUS OF PLANTS IN RELATION TO PATTERNS OF VARIATIONS IN CONCENTRATIONS OF DRY MATTER AND NUTRIENT ELEMENTS IN BASE-TO-TOP LEAVES: I. DISTRIBUTION OF CONTENTS AND CONCENTRATIONS OF DRY MATTER IN TOMATO PLANTS UNDER DIFFERENT GROWTH CONDITIONS,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
B. Friis-Nielsen.
Plant Soil, Vol 39, No 3, p 661-673, 1973. Illus.

Descriptors: *Plant growth, *Plant growth regulations, *Plant growth substances, Plant physiology, Tomatoes, Field crops, Water requirements, *Analytical techniques.
Identifiers: *Dry matter, Leaves, Tomato.

Patterns of variations in dry matter concentrations in tomato plants reflected production and translocation of dry matter, implying the possibility of controlling and regulating growth and development of plants by use of dry matter concentration as a useful parameter. Dry matter concentrations, analogous to nutrient concentrations, varied depending on growth conditions, and on type, age and position of plant organs. Interpretation of patterns of variations in contents and concentrations of leaf dry matter in plants, grown under widely different conditions, agreed with the source/sink hypothesis. High water applications were associated with high dry matter concentrations in upper leaves of young pot plants with low sink capacity and with low dry matter concentrations in leaves of older, through-grown plants with high sink capacity. Accumulation of dry matter in upper leaves of plants is suggested to be associated with development of secondary sinks and assumulation of dry matter in lateral shoots is considered as a possible explanation of apical dominance. Water regime and transpiration influenced distribution of contents of dry and fresh matter and of absorbed nutrient elements. Redistribution was influenced by water regime. (See also W75-08309)--Copyright 1974, Biological Abstracts, Inc.
W75-08308

GROWTH, WATER AND NUTRIENT STATUS OF PLANTS IN RELATION TO PATTERNS OF VARIATIONS IN CONCENTRATIONS OF DRY MATTER AND NUTRIENT ELEMENTS IN BASE-TO-TOP LEAVES: II. RELATIONS BETWEEN DISTRIBUTION OF CONCENTRATIONS OF DRY MATTER AND NUTRIENT ELEMENTS IN TOMATO PLANTS,
Royal Veterinary and Agriculture Coll., Copenhagen (Denmark). Hydrotechnical Lab.
B. Friis-Nielsen.
Plant Soil, Vol 39, No 3, p 675-686, 1973. Illus.

Descriptors: Tomatoes, Field crops, *Plant growth, *Plant growth regulators, *Plant growth substances, *Chemical analysis, Water requirements, *Nutrients.
Identifiers: *Dry matter, Leaves.

Patterns of distribution curves of concentrations of dry matter and of concentrations based on dry and fresh matter, of N and sum cations in base-to-top leaves were investigated in 3 cultivars of tomato plants grown under widely different conditions. The set of all 3 distribution curves reflected changes in contents of dry matter and water caused by processes underlying growth and development of the plants, and decisive for a true interpretation of the chemical plant analysis. Symmetric patterns were obtained of distribution curves of N and sum cations in leaves from base to top, provided corrections were made for irreleveant contents of dry matter and water. Positions and slopes of distribution curves of dry matter concentrations were governed by dry matter production and translocation and similar to those of nutrient concentrations by age of plants and by supplies of nutrients and water. Increasing water supplied effected increasing dry matter production associated with increasing rates of translocation of dry matter in accordance with the source/sink hypothesis. Results of the investigation demonstrate the possibility to control and regulate growth and development of plants by use of leaf dry matter concentration and leaf nutrient concentrations, the latter based on both dry and fresh matter, as important parameters, provided reference values are known. (See also W75-08308)--Copyright 1974, Biological Abstracts, Inc.
W75-08309

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
D. R. Stoddart, G. W. Bryan, and P. E. Gibbs.
J Nat Hist, Vol 7, No 1, p 33-46, 1973, Illus.
Identifiers: Calcium, Conocarpus, Inlands, Laguncularia, Magnesium, *Mangroves, Potassium, Rhizophora, Sodium, *West Indies(Barbuda), *Water chemistry, Brackish water.

Mangrove vegetation, comprising not only Laguncularia and Conocarpus, but also a closed woodland of Rhizophora, is found in inland situations in Barbuda, West Indies, having no connection with the sea and associated with geological and geomorphic features of either lat Pleistocene or possibly earlier Holocene age. These mangroves are associated with brackish water. Analyses show lowered concentrations of Na, K and Mg and higher concentrations of Ca and Sr compared with sea water having the same chloride content, the higher Ca and Sr concentrations probably resulting from diagenetic changes in the limestone. The inland mangroves are either relict from the period of formation of the lithified beach ridges, or they have more recently colonized the platin area.--Copyright 1973, Biological Abstracts, Inc.
W75-08314

BIRDS AND MAMMALS OF ANEGADA ISLAND, BRITISH VIRGIN ISLANDS,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
A. Labastille, and M. Richmond.
Caribb J Sci, Vol 13, No 1/2, p 91-109, 1973, Illus.

Descriptors: *Birds, *Mammals, *Ecology, West Indies.
Identifiers: *Anegada Islands(British Virgin Islands).

Results of a recent biological reconnaissance of Anegada Island in the Greater Antilles (United Kingdom) are presented. The island is uniquely positioned between the Greater Antilles and Lesser Antilles and resembles the latter. The topography, flora, fauna and general ecology are described. All animal life, including man, is tied to small, temporary fresh-water pools and underground fresh-water reservoirs which are accessible from surface sinks and wells. Agriculture is practiced on a very limited scale and, until recently the native blacks have lived simple lives as fishermen. Birds (55 spp.) were observed and 75 small mammals were trapped or netted. Twenty-eight bird species represent 1st records for Anegada. In 1967, the DEV-CAN Corporation of England leased Anegada for development of a large resort. Construction was begun before the company abandoned the project. The government of the British Virgin Islands may take over the tourist development of Anegada. Several research and conservation needs are listed.--Copyright 1974, Biological Abstracts, Inc.
W75-08317

THE INFLUENCE OF SOIL WATER CONTENT ON THE UPTAKE OF IONS BY ROOTS: I. SOIL WATER CONTENT GRADIENTS NEAR A PLANE OF ONION ROOTS,
Nottingham Univ. (England). School of Agriculture.
R. J. Dunham, and P. H. Nye.
J Appl Ecol, Vol 10, No 2, p 585-598, 1973, Illus.
Identifiers: Allium-cepa, Ions, *Onion roots, *Roots, *Soil water, Absorption.

Water content and ion concentration gradients in soil near a plane of onion Allium cepa seedling roots were measured. Using the water content-matric potential relation for this soil, the water content gradients were transformed into matric potential gradients. Potential gradients near the roots were steeper in drier soil. In the driest soil, which was initially at -3 bar, the potential at the root surface fell to about -20 bar. However, if the root-soil geometry had been radial rather than linear, the potential at the root surface would have been about -3.5 bar, which supported the view that steep potential gradients do not normally occur near roots.--Copyright 1974, Biological Abstracts, Inc.
W75-08330

IDENTIFICATION OF TREE STUMPS, AND DRIFTWOOD ASSOCIATED WITH TEPHRA LAYERS IN ALLUVIUM, PEAT, AND DUNE SANDS,
Department of Scientific and Industrial Research, Rotorua (New Zealand). Soil Bureau.
W. A. Pullar, and Rajni N. Patel.
N Z J Bot, Vol 10, No 4, p 605-614, 1972, Illus.
Identifiers: Alluvium, Dacrydium, *Driftwood, Dunes, Leptospermum, *New Zealand, Peat, Podocarpus, Sands, *Tephra layers, *Tree stumps, Vegetation.

From 26 sites in the central and eastern parts of North Ireland, New Zealand, 37 specimens of wood have been identified botanically and their stratigraphic position established in relation to tephra layers of known age. Driftwood derived mainly from podocarp trees (Dacrydium, Podocarpus) was sampled from 5 sites associated with old shorelines and river terraces in the Waipaoa River

Catchment and from 2 sites in the Whakatane River Catchment. The results indicate times at which the corresponding vegetation was growing in the upper parts of these catchments. Stumps between tephra layers sampled from coastal lowlands were mostly from podocarp trees growing in situ during the interval 2100-1800 yr B.P. The paper also discusses the relationship of earth movement at Gisborne to other events including the Taupo Pumice eruptions, the significance of layers of preserved manuka (Leptospermum) in swamps, and changes in the coastline near Whakatane.--Copyright 1973, Biological Abstracts, Inc.
W75-08336

ANALYSES OF A FOREST DRAINAGE EXPERIMENT IN NORTHERN ONTARIO. I: GROWTH ANALYSIS,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
For primary bibliographic entry see Field 4A.
W75-08337

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: II. EFFECT ON CHLOROSIS DEVELOPMENT, AND SOME NUTRIENT ELEMENT CONTENTS IN SOIL AND PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W75-08344

2J. Erosion and Sedimentation

RECONNAISSANCE OF SEDIMENTATION IN THE UPPER RIO BERMEJO BASIN, ARGENTINA,
Geological Survey, Menlo Park, Calif.
G. Porterfield.
Open-file report, March 1972. 114 p, 17 fig, 4 tab, 9 ref, 3 append.

Descriptors: *Sediment yield, *South America, Sedimentation, Sediment load, Data collections, Hydrologic data.
Identifiers: *Rio Bermejo(Argentina).

Sediment yields in parts of the Upper Rio Bermejo basin, Argentina are among the largest recorded in the world. Thus, an important consideration in development of water resources in this basin is the effect of sediment on reservoir life and on the design and operation of dams, hydroelectric plants, and diversion structures. Sediment transport conditions were studied at 17 locations and present estimates of reservoir life at 17 proposed sites in the Upper Rio Bermejo basin. The climates in the Upper Rio Bermejo basin range from arid to subtropical. Precipitation, most of which is rainfall, ranges from less than 200 mm to more than 1,300 mm per year and about 80% of the precipitation falls from November to March. Precipitation does not vary directly with altitude but is controlled by other factors. The least precipitation (200 mm) is in the high mountains on the west side of the basin. The precipitation increases eastward to a maximum (1,300 mm) in the northcentral part of the basin, and then decreases to about 600 mm at the confluence of the Rios Bermejo and San Francisco on the east. Temperatures range from subzero minima in the mountains on the west to 50 deg C at the edge of the plains on the east. The warm season occurs at the same time as the rainy season. (Knapp-USGS)
W75-07859

NATURAL AND MODIFIED PLANT COMMUNITIES AS RELATED TO RUNOFF AND SEDIMENT YIELDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4C.
W75-07866

BIOLOGICAL AND CHEMICAL ASPECTS OF THE SAN FRANCISCO BAY TURBIDITY MAXIMUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W75-07870

SOURCES OF SUSPENDED MATTER IN WATERS OF THE MIDDLE ATLANTIC BIGHT,
Geological Survey, Woods Hole, Mass.
R. H. Meade, P. L. Sachs, F. T. Manheim, J. C. Hathaway, and D. W. Spencer.
Journal of Sedimentary Petrology, Vol 45, No 1, p 171-188, March 1975. 12 fig, 3 tab, 28 ref, append.

Descriptors: *Suspended load, *Sea water, *Provenance, *Organic matter, *Atlantic Ocean, Continental shelf, Erosion, Marine geology, Waves(Water), Storms.
Identifiers: *Middle Atlantic Bight.

Suspended matter collected in the Middle Atlantic Bight (the coastal segment of the United States between Cape Cod and Cape Hatteras) in September 1969 was predominantly organic. It contained an average of 80% combustible organic matter in surface waters and 40% near bottom. Total suspended concentrations decreased between the inner shelf and the shelf break by an order of magnitude in both near-surface and near-bottom waters. The noncombustible fraction of the suspended matter decreased over the same distance by one order of magnitude in the near-bottom waters and two orders of magnitude in near-surface waters. Recently contributed river sediment is not a significant constituent of the suspended matter in the waters of the shelf, particularly the outer shelf. Most of the inorganic material in suspension represents resuspended bottom sediments (at least some of which are relict) whose suspended concentrations are increased noticeably by storms. (Knapp-USGS)
W75-07875

MARINE PHOSPHORITE FORMATION OFF PERU,
University of South Florida, St. Petersburg. Marine Science Inst.
For primary bibliographic entry see Field 2K.
W75-07876

NET TRANSPORT OF SEDIMENT THROUGH THE MOUTHS OF ESTUARIES: SEAWARD OR LANDWARD,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 2L.
W75-07878

REMOTE SENSING TECHNIQUES FOR EVALUATION OF URBAN EROSION AND SEDIMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4C.
W75-07880

CHANNEL CHANGES,
Geological Survey, Boise, Idaho.
For primary bibliographic entry see Field 4C.
W75-07884

COMPUTER SIMULATION OF SEDIMENTATION IN MEANDERING STREAMS,
Queens Univ., Belfast (Northern Ireland). Dept. of Geology.
J. S. Bridge.
Sedimentology, Vol 22, No 1, p 3-43, February 1975. 25 fig, 3 tab, 69 ref, append.

Descriptors: *Sedimentation, *Meanders, *Erosion, *Computer models, *Systems analysis, Analytical techniques, Aggradation, Stratification, Particle size, Stream stabilization, Mathematical models, Streams, *Simulation analysis.
Identifiers: *Channel migration, Point bar sediments, Meander geometry, Meander movement.

A dynamic mathematical model for simulation of sedimentation in meandering streams was described. For a given physical situation and a single time increment, the following aspects of the system were included in the component models: the form of the meander, the movement of the meander in plan, the hydraulic properties of the channel in the bend, the nature and occurrence of cut-off, and a relative measure of discharge during a seasonal high period. The model in the form of a Fortran IV computer program was used to simulate various aspects of sedimentation in meandering streams under different input conditions. The model recorded the systematic distribution of sedimentary structures. It also recorded large-scale lateral changes in grain size and sedimentary structure associated with changes in the shape of developing meanders. Wher appropriate field data exist, the model can be used in the more accurate recognition of ancient fluviatile sediments. A representative application of the model to the quantitative interpretation of an ancient point bar deposit was illustrated. (Singh-ISWS)
W75-07891

SEDIMENT DEPOSITION FROM FLOCCULATED SUSPENSIONS,
Bedford Institute of Oceanography, Dartmouth, Nova Scotia (Canada), Atlantic Oceanographic Laboratory.
K. Kranck.
Sedimentology, Vol 22, No 1, p 111-123, February 1975. 10 fig, 26 ref.

Descriptors: *Suspended load, *Flocculation, *Particle size, *Settling velocity, *Distribution patterns, Suspension, Estuaries, Salinity, Sea water, Stokes law, Deposition(Sediments), Sedimentology, *Canada.
Identifiers: *Flocculated suspensions, *Nova Scotia, Non-normal curves.

Suspended sediment in coastal environments with high inorganic content have characteristic broad size distributions and are composed of both single grains and flocculated aggregates. These flocculated suspensions have stable size distributions the model size of which is dependent on the model size of the deflocculated single grain distributions. Comparison between theoretical settling speeds of particles in natural suspensions indicates that most grains smaller than the deflocculated single grain mode settle as part of flocs, whereas the particles larger than the mode settle as single grains. As the result the size distribution curves of sediment populations which settle out during consecutive intervals are composed of a modal peak of larger grains and a low flat portion of smaller grains and resemble the asymmetrical non-normal curves common for muddy sediments. This break between the tail and the modal peak which appears on cumulative curves plotted on probability paper as a change in the slope is usually related to the presence of two log-normal sediment populations, transported by separate mechanisms. (Singh-ISWS)
W75-07892

DISTRIBUTION OF MICROBIAL ADENOSINE TRIPHOSPHATE IN SALT MARSH SEDIMENTS AT SAPELO ISLAND, GEORGIA,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W75-07899

SUBMERGED SOILS IN THE NORTHWESTERN MEDITERRANEAN SEA AND THE PROCESS OF HUMIFICATION,
Centre Universitaire de Perpignan, Moulin a Vent (France). Centre de Recherches de Sedimentologie Marine.
For primary bibliographic entry see Field 5B.
W75-07900

THE INFLUENCE OF WIND VELOCITY ON THE SIZE DISTRIBUTIONS OF AEROSOLS GENERATED BY THE WIND EROSION OF SOILS,
National Center for Atmospheric Research, Boulder, Colo.
D. A. Gillette, I. H. Blifford, Jr., and D. W. Fryrear.
Journal of Geophysical Research, Vol 79, No 27, p 4068-4075, September 20, 1974. 8 fig, 2 tab, 13 ref.

Descriptors: *Wind erosion, *Aerosols, *Particle size, Soil erosion, Soils, Soil physical properties, Winds, Wind velocity, On-site investigations, Filters.

The relationship of the relative size distribution of soil wind erosion aerosols to wind velocity was examined in field measurements and wind tunnel simulations. The ratio of sedimentation velocity to friction velocity, square root of (vertical momentum/air density), at which aerosol particles were significantly affected by settling was larger than 0.12 and smaller than 0.68. The shapes of the size distributions of soil wind erosion aerosols (2 micrometers less than r less than 10 micrometers) were fairly constant with wind speed. This result is evidence that the dominant mechanism of aerosol production by soil erosion is sandblasting of the soil surface. (Sims-ISWS)
W75-07915

MICROSCALE TRANSPORT OF SAND-SIZED SOIL AGGREGATES ERODED BY WIND,
National Center for Atmospheric Research, Boulder, Colo.
D. Gillette, and P. A. Goodwin.
Journal of Geophysical Research, Vol 79, No 27, p 4080-4084, September 20, 1974. 2 fig, 4 tab, 13 ref.

Descriptors: *Wind erosion, *Soil erosion, *Model studies, On-site data collections, Mathematical models, Particle size, Sediment transport, Aggregates, Soils, Aerosols, Wind velocity, Sedimentation, Diffusion.

Field measurements of the vertical profiles of horizontal fluxes of airborne, sand-sized soil aggregates were shown to be in good agreement with solutions of an equation that express the dependence of the concentration of sand at a given height on vertical diffusion and sedimentation. This approach treats sand as a diffusing agent rather than as projectiles that are affected by the wind only on the horizontal direction. The observed horizontal sand fluxes were shown to be in agreement with empirical formulas that express total horizontal flux of sand as a function of wind and soil parameters. (Sims-ISWS)
W75-07916

THE WESTERN BOUNDARY UNDERCURRENT AS A TURBIDITY MAXIMUM OVER THE PUERTO RICO TRENCH,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
B. E. Tucholke, and S. Eittreim.
Journal of Geophysical Research, Vol 79, No 27, p 4115-4118, September 20, 1974. 3 fig, 15 ref. NSF Grants GA-41657, GA-27281; ONR Contract N0014-67-A-0108-0004.

Descriptors: *Turbidity, *Oceans, *Trenches, Atlantic Ocean, Suspended solids, Sediments, Temperature, Water circulation, Sounding, Depth, Exploration, Oceanography, Puerto Rico.
Identifiers: *Nephelometers, *Puerto Rico trench, Undercurrents.

Nephelometer measurements in the Puerto Rico trench record a midwater light scattering maximum at the depth of the near-bottom nepheloid layer found in the deep Atlantic basin to the northwest. This mid-water maximum is best developed near the south slope of the trench and is interpreted as a southeasterly continuation of the western boundary undercurrent, which has been documented along the continental rise of eastern North America. The eastward-advecting core of the flow overrides clearer colder antarctic bottom water that enters the trench from the east. A near-bottom nepheloid layer, best developed in the eastern part of the trench, appears to be associated with the westward-flowing antarctic bottom current. (Sims-ISWS)
W75-07918

SIMULATION OF SOIL EROSION--PART I. DEVELOPMENT OF A MATHEMATICAL EROSION MODEL,
International Rice Research Inst., Los Banos, Laguna (Philippines).
W. P. David, and C. E. Beer.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 126-133, January-February 1975. 2 fig, 21 ref.

Descriptors: *Soil erosion, *Mathematical models, *Overland flow, *Precipitation intensity, *Raindrops, *Stream erosion, Sheet erosion, Rill erosion, Runoff, Suspended solids, Cultivation, Gully erosion, Model studies, Watersheds(Basins), Equations, Sediment transport, *Simulation analysis.
Identifiers: *Land slope, Wash load, Kentucky Watershed Model.

Results of a study conducted to simulate the process of sheet erosion by water were described. The primary objective of the study was to develop a mathematical model of erosion by water. The Kentucky Watershed Model was adopted to generate values of overland flow to be used in the erosion model. The other input to the model was the intensity of the precipitation. Equations expressing soil erosion from stream banks, impervious surfaces, and raindrop splash were developed. In addition, the carrying capacity of the overland flow was continuously evaluated to determine whether soil particles were being removed and transported from storage or deposited. The equations upon which the mathematical model was based are power functions with parameters that are to be evaluated during calibration runs of the model. (See also W75-07927) (Bhowmik-ISWS)
W75-07926

SIMULATION OF SOIL EROSION--PART II. STREAMFLOW AND SUSPENDED SEDIMENT SIMULATION RESULTS,
International Rice Research Inst., Los Banos, Laguna (Philippines).
W. P. David, and C. E. Beer.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 130-133, January-February 1975. 2 fig, 3 tab, 8 ref.

Descriptors: *Simulation analysis, *Soil erosion, *Overland flow, *Precipitation intensity, *Sheet erosion, Mathematical models, Calibrations, Snowmelt, Suspended load, Stream erosion, Bank erosion, Scour, Streamflow, *Iowa, Model studies, Watersheds(Basins).
Identifiers: *Kentucky Watershed Model, Land slope, Four Mile Creek Watershed.

A sheet erosion model was developed to simulate sheet erosion from small agricultural watersheds. The sheet erosion model was used in conjunction with the Kentucky Watershed Model, which is a modified version of the Stanford Watershed Model. The Kentucky Watershed Model was modified and adapted to Iowa conditions. To evaluate the feasibility of the sheet erosion model, it was tested on the Four Mile Creek Watershed near Traer, Iowa. The simulated daily, monthly, and annual suspended sediment loads compared favorably to the observed values. It was mentioned that the sheet erosion model cannot be applied for large watersheds. The model also cannot predict the sediment deposition along floodplains and it lacks sufficient parameters to define the seasonal effect on some of the sheet erosion parameters. (See also W75-07926) (Bhowmik-ISWS)
W75-07927

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
For primary bibliographic entry see Field 5G.
W75-07931

NONERODIBLE AGGREGATES AND CONCENTRATION OF FATS, WAXES, AND OILS IN SOILS AS RELATED TO WHEAT STRAW MULCH,
Agricultural Research Service, Akron, Colo. Central Great Plains Field Station.
For primary bibliographic entry see Field 4D.
W75-07940

CONCENTRATION EFFECTS OF SETTLING-TUBE ANALYSIS,
Technische Hogeschool, Delft (Netherlands). Department of Civil Engineering.
C. Kranenburg, and H. J. Geldof.
Journal of Hydraulic Research, Vol 12, No 3, p 337-355, 1974. 5 fig, 15 ref, 1 append.

Descriptors: *Sediments, *Particle size, *Settling velocity, Fluid mechanics, Velocity, Reynolds number, Analysis, Convection, *Mathematical models, Hydraulics.
Identifiers: *Hindered settling, Settling tube.

A mathematical model describing the unsteady settling of nonuniform sediment samples was developed, which accounts for the influence of sediment concentration on the fall velocity. The resulting equations were solved by using the method of integration along characteristics. An estimating procedure for the settling-tube size required was established. The procedure was based on the requirement that the relative error in the settling time of each particle, due to possible concentration effects such as hindered settling and settling convection, be less than a prescribed value. A lack of unambiguous experimental data on settling convection prevented a positive statement, this phenomenon seemed to be more severe than hindered settling. If settling convection occurred, it would apparently cause unacceptable errors in the analysis of the relatively large sample sizes (for the settling-tube dimensions) recommended in the literature. (Adams-ISWS)
W75-07949

PHOSPHORUS UPTAKE AND RELEASE BY LAKE ONTERIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program; and Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5A.
W75-07972

KAIMU BEACH HAWAII, PROPOSED SHORE PROTECTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-08052

VIRGINIA KEY BEACH EROSION CONTROL PROJECT, SECOND PERIODIC NOURISHMENT AND GROINS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W75-08053

REVIEW OF GEOLOGICAL RESEARCH AS IT RELATES TO AN UNDERSTANDING OF GREAT LAKES LIMNOLOGY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W75-08144

ENVIRONMENTAL ASSESSMENT OF SEDIMENT SOURCES AND SEDIMENTATION DISTRIBUTIONS FOR THE LAKE LA FARGE WATERHSED AND IMPOUNDMENT,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-08161

ORGANIC SUBSTANCES IN SEDIMENT AND SETTLING MATTER DURING SPRING IN A MEROMICTIC LAKE SUIGETSU,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2H.
W75-08257

MUD-WATER EXCHANGE OF PHOSPHATE AND OTHER IONS IN UNDISTURBED SEDIMENT CORES AND FACTORS AFFECTING THE EXCHANGE RATES,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
L. Kamp-Nielson.
Arch Hydrobiol, Vol 73, No 2, p 218-237, 1974. Illus.
Identifiers: Antibiotics, *Denmark, Diffusion, Ions, Lakes, Microorganism, Mud, Oxygen, *Phosphates, *Sediment cores, *Lake sediments, *Mud-water interfaces, *Ion exchange.

The exchange rates of P,N and to a lesser extent Fe, Ca and silicate across the sediment surface were determined by experiments with undisturbed sediment cores from the profundal of a spectrum of Danish lakes. The effects of oxidation state, antibiotics and pH on the exchange rates were studied and attempts are made to relate the exhange to sediment parameters. The N exchange involves mineralization, nitrofication and denitrification and occurs by biological processes. When O2 is present the phosphate exchange is governed by adsorption, but microorganisms also seem to be involved. Under anaerobic conditions the phosphate release is linearly dependent on the concentration gradient across the mud surface and the exchange may be explained in terms of diffusion with a diffusion coefficient of 0.6 x 10 to the minus 6 power x cm2 x s to the minus 1 power. The adsorption and the concentration gradient are influenced by a pH-dependent dissolution and precipitation of Ca and Fe phosphates.--Copyright 1974, Biological Abstracts, Inc.
W75-08320

STRATIGRAPHIC EFFECTS OF TUBIFICIDS IN PROFUNDAL LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W75-08322

ON RELATIONSHIPS BETWEEN THE NATURE OF THE SEDIMENT AND THE CHEMICAL PROPERTIES OF THE HYPORHEAL BIOTOPE IN THE HUNGARIAN SECTION OF THE DANUBE (DANUBIALIA HUNGARICA LIX),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol, 13. p 53-67, 1971. Illus.

Descriptors: *Rivers, Europe, Flow, Soil types, Chemical properties, Water properties, Groundwater, Physical characteristics, *Sediments.
Identifiers: *Biotopes, *Danube River, Danubialia, *Hungary, *Hyporheal biotope.

Factors influencing the properties of the hyporheal biotope in the Hungarian Danube section were studied. Such biotopes were strongly influenced by the soil composition, the chemical composition of the groundwater and of the river water, the soil permeability, and by the flow conditions. Decrease in soil temperature, pH value, and dissolved O2 content with distance from the riverbank were determined.--Copyright 1973, Biological Abstracts, Inc.
W75-08349

2K. Chemical Processes

A SUMMARY OF SELECTED CHEMICAL-QUALITY CONDITIONS IN 66 CALIFORNIA STREAMS, 1950-72,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W75-07858

GENESIS OF HYDROGEOCHEMICAL FACIES OF GROUND WATERS IN THE PUNJAB REGION OF PAKISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 5B.
W75-07865

GEOCHEMICAL EQULIBRIA AT LOW TEMPERATURES AND PRESSURES,
Geological Survey, Reston, Va.
B. B. Hanshaw, and W. Back.
In: Encyclopaedia Britannica, 15th Edition, p 1028-1035, 1974. 3 fig, 4 ref.

Descriptors: *Water chemistry, *Geochemistry, *Equilibrium, Aqueous solutions, Thermodynamic behavior, Thermodynamics, Chemical reactions.

Geochemical equilibria are involved in most natural geological and hydrological processes at or near the surface of the Earth. Low-temperature, low-pressure studies of chemical equilibria are concerned with the processes that take place between the lowest temperature on Earth and approximately 400C, and between near vacuum and several kilobars of pressure. The ultimate goal of low-temperature, low-pressure equlibria studies is to describe the various Earth environments that may influence Earth materials and water by reason of naturally or artificially imposed geochemical stresses. The parameters that have proven useful for environmental description are (1) the electromotive force or potential of reactions (Eh), (2) acidity (pH), (3) pressure, (4) temperature, (5) solubility of minerals, and (6) the chemistry of pore solutions in rocks. A unified description of the Earth's environments becomes possible only when the several important parameters and their variations are examined from the viewpoint of thermodynamics. Included is consideration of the principles of thermodynamics that are of special relevance to understanding geochemical equilibria at low temperatures and pressures and of geochemical diagrams that are employed to delimit environmental conditions. Additionally, there is consideration of several specific equilibria that are of significance in nature. These include carbonate, iron, and uranium systems, soil conditions, and osmotic equilibria. (Knapp-USGS)
W75-07867

MARINE PHOSPHORITE FORMATION OFF PERU,
University of South Florida, St. Petersburg. Marine Science Inst.
F. Manheim, G. T. Rowe, and D. Jipa.
Journal of Sedimentary Petrology, Vol 45, No 1, p 243-251, March 1975. 9 fig, 1 tab, 41 ref.

Descriptors: *Diagenesis, *Phosphates, Continental shelf, Connate water, Sedimentation, Water chemistry, Sea water, Carbonates, Plankton, Sedimentology.
Identifiers: *Peru, Foraminifera.

Formation of contemporary phosphorite occurs in the Peru-Chile offshore area. Synthesis occurs as a result of replacement of carbonate tests of Holocene benthonic Foraminifera in the interstitial waters of organic-rich sediments. Step-by-step phosphatization of Holocene benthic Foraminifera is demonstrated. Four simultaneous requirements for formation of phosphorites are: (a) sediments rich in organic detritus blanketed by (b) water with low concentrations of dissolved oxygen, (c) low rates of inorganic (especially terrigenous) sedimentation and (d) low but not negligible concentrations of calcium carbonate in the sediment. (Knapp-USGS)
W75-07876

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF NORTHEASTERN WYOMING, 1974-75.
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-07887

WATER QUALITY OF HYDROLOGIC BENCH MARKS--AN INDICATOR OF WATER QUALITY IN THE NATURAL ENVIRONMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-07888

NATURAL DISTRIBUTION OF TRACE METALS IN SEDIMENTS FROM A COASTAL ENVIRONMENT, TOR BAY, ENGLAND,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 2L.
W75-07895

DIFFUSION COEFFICIENTS CALCULATED FROM THE MEDITERREAN SALINITY ANOMALY IN THE NORTH ATLANTIC OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2L.
W75-07912

ELECTRONIC DIGITIZATION AND SENSOR RESPONSE EFFECTS ON SALINITY COMPUTATION FROM CTD FIELD MEASUREMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W75-07914

THE DETERMINATION OF THE INDEX OF REFRACTION DISTRIBUTION OF OCEANIC PARTICULATES,
Oregon State Univ., Corvallis. School of Oceanography.
J. R. V. Zaneveld, D. M. Roach, and H. Pak.
Journal of Geophysical Research, Vol 79, No 27, p 4091-4095, September 20, 1974. 3 fig, 2 tab, 17 ref.
ONR Contract N00014-67-A-0369-0007.

Descriptors: *Refractivity, *Suspended solids, *Particle size, *Optical properties, Physical properties, Light, Opacity, Mathematical models, Reflectance, Sea water, Oceans, Dispersion, Turbidity, Suspension, Particle shape, Phytoplankton, Size, Distribution.
Identifiers: Mie theory, Sargasso Sea, Coulter counter, Biomodal distribution.

A method was described for determining the index of refraction distribution and the particle size distribution of suspended particles. The distributions

are obtained by breaking down an observed volume scattering function into its contributing components. The component scattering functions are calculated by using Mie theory. The component functions include all size distributions and indices of refraction that can be expected to be present. The method was applied to a volume scattering function observed in the Sargasso Sea. Forty components were used with five different indices of refraction and eight different particle size distributions. The resultant index of refraction distribution was bimodal. Components with indices of 1.05 and 1.15 dominated the calculated volume scattering function. The calculated particle size distribution fell within experimentally determined limits for the size distribution. (Henley-ISWS)
W75-07917

ANALYSIS OF LAS, ABS AND COMMERCIAL DETERGENTS BY TWO-PHASE TITRATION,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5A.
W75-07937

FLUORINE IN GROUND WATER AS A GUIDE TO PB-ZN-BA-F MINERALIZATION,
Toronto Univ. (Ontario). Dept. of Geology.
G. S. Graham, S. E. Kesler, and J. C. Van Loon.
Economic Geology, Vol 70, No 2, p 396-398, March-April 1975. 2 fig, 12 ref.

Descriptors: *Fluorine, *Geochemistry, *Chemical analysis, *Groundwater, *Fluorides, Inorganic compounds, Halogens, Analysis, Evaluation, Chemistry, Instrumentation, Chemical properties, Mineralogy, Exploration, Analytical techniques, Canada, Surveys.
Identifiers: *Fluorite, Fluorapatite.

Analysis of fluoride in groundwater deserves careful consideration as a method of geochemical exploration for Pb-Zn-Ba-F mineralization in the flat-lying carbonate rocks of mid-continent North America. The interpretation of analytical results was not rendered impossible by fluoride complexing, precipitation of fluoride bearing phases, or seasonal variations in groundwater fluoride content. Groundwater sampling in stratigraphically or structurally favorable areas should be useful in locating blind fluorite or fluorite-bearing mineralization at depths of several hundred feet. (Henley-ISWS)
W75-07953

CHANGE IN THE CHEMISTRY OF NATURAL WATERS IN LANDSCAPES UNDER AGRICULTURAL USE,
For primary bibliographic entry see Field 5B.
W75-07974

GROUND-WATER QUALITY RELATED TO IRRIGATION WITH IMPORTED SURFACE OR LOCAL GROUND WATER,
Agricultural Research Service, Fresno, Calif.
For primary bibliographic entry see Field 5B.
W75-07978

TEMPERATURE CONTROLLED HEATING OF THE GRAPHITE TUBE ATOMIZER IN FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Umea Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W75-08079

SOME ANALYTICAL APPLICATIONS OF REACTION-RATE-PROMOTING EFFECTS--THE TRIS(1,10-PHENANTHROLINE)IRON(II)-CHROMIUM(VI) INDICATOR REACTION,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W75-08080

MICRODETERMINATION OF METALS IN ORGANOMETALLIC COMPOUNDS BY THE OXINE METHOD AFTER CLOSED FLASH COMBUSTION,
Cairo Univ., Giza (Egypt). Microanalytical Unit.
For primary bibliographic entry see Field 5A.
W75-08091

ON THE CHEMICAL MASS-BALANCE IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge, Mass. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W75-08095

SOLUBILIZATION OF DIMETHYLMERCURY BY HALIDE IONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-08096

REVIEW OF GEOLOGICAL RESEARCH AS IT RELATES TO AN UNDERSTANDING OF GREAT LAKES LIMNOLOGY,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W75-08144

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS, I. CONCENTRATION-TIME RELATIONSHIPS,
Water Planning for Israel Ltd., Tel-Aviv.
A. Mercado, and G. K. Billings.
Journal of Hydrology, Vol 24, No 3/4, p 303-331, February 1975. 9 fig, 2 tab, 29 ref. OWRT B-038-NMEX(1), WRRI-3109.140.

Descriptors: *Kinetics, *Geochemistry, *Carbonate rocks, *Aquifers, *Groundwater, Hydrogeology, Chemical reactions, Dating, Radioactive dating, Model studies, Mass transfer, Tracers, Carbon radioisotopes, Florida, Aqueous solutions, Thermodynamics, Calcite, Dolomite, Gypsum, Computer programs.
Identifiers: *Limestone aquifers, Concentration-time relationships, Dissolution, Aqueous species, Debye-Huckel equation.

The importance of available groundwater chemical data for hydrologic investigations has been relatively neglected. Two general courses exist for use of groundwater chemical data and dissolution kinetics in hydrologic investigations: (1) estimating relative ages according to precalibrated concentration-time relationships similar to that of tritium and C14 dating techniques; and (2) integrated study of both hydrologic and geochemical phenomena with the aid of combined hydrogeochemical models. A kinetic model for the dissolution of multimineral assemblages in porous media was derived with special emphasis on the simultaneous dissolution of calcite, dolomite, and gypsum in some carbonate aquifers. Supersaturation on groundwater samples with respect to calcite and dolomite frequently occurs and was explained by the relatively high solubility of gypsum, resulting in kinetic competition among dissolving minerals. The applicability of a computerized kinetic model was domonstrated by the evaluation of hydrogeochemical data for the limestone aquifer of central Florida. The kinetic model was calibrated with the aid of available hydrologic estimates and chemical data for part of the aquifer. Chemical age estimates based on calibrated concentration-time relationships of aqueous species compared reasonably well with available C14 data. (Visocky-ISWS)
W75-08190

THE DETERMINATION OF 2H2O IN WATER AND BIOLOGICAL FLUIDS BY GAS CHROMATOGRAPHY,
Ceskoslovenska Akademie Ved, Brno. Ustav Instrumentalni Analyticke Chemie.
P. Bocek, M. Deml, and K. Tesarik.
J Chromatogr, Vol 87, No 1, p 246-249, 1973. Illus.
Identifiers: Biological fluids, Chromatography, *Gas chromatography, *Heavy water, Pollutant identification, Separation techniques, Hydrogen isotopes, Electrolytic reduction, Chemical reactions.

Heavy water can be determined indirectly by its measurement in a gaseous mixture of hydrogen isotopes produced by the electrolytic or chemical reductive decomposition of a sample. Gas chromatography is useful in separating out other compounds, e.g., O2 and N2 from air.--Copyright 1974, Biological Abstracts, Inc.
W75-08264

INLAND MANGROVES AND WATER CHEMISTRY, BARBUDA, WEST INDIES,
Cambridge Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 2I.
W75-08314

EXTRACTION OF SOIL SOLUTION FROM FLOODED SOIL USING A POROUS PLASTIC FILTER,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5G.
W75-08335

ON RELATIONSHIPS BETWEEN THE NATURE OF THE SEDIMENT AND THE CHEMICAL PROPERTIES OF THE HYPORHEAL BIOTOPE IN THE HUNGARIAN SECTION OF THE DANUBE (DANUBIALIA HUNGARICA LIX),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 2J.
W75-08349

2L. Estuaries

SOME UPPER MIOCENE AND PLIOCENE OSTRACODA OF ATLANTIC COASTAL REGION FOR USE IN THE HYDROGEOLOGIC STUDIES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-07860

THE BIG CYPRESS SWAMP,
Geological Survey, Miami, Fla.
B. F. McPherson.
In: Environments of South Florida: Present and Past; Miami Geological Society Memoir 2, Gleason, P. J., editor, p 8-17, November 1974, 8 fig, 18 ref.

Descriptors: *Swamps, *Wetlands, *Florida, Topography, Vegetation, Environment, Ecology, Hydrogeology.
Identifiers: *Big Cypress Swamp(Fla).

The Big Cypress Swamp differs from the adjacent Everglades in topography, soils, water quality, and vegetation. Because the Swamp has relatively more high land, inundation and soil deposition are less extensive in the Swamp than in the Everglades, Soil in the Swamp is usually a thin (less than 0.6 meters) layer of marl, sand, or mixtures of

the two, or is absent where limestone crops out, whereas soil in the Everglades is usually deeper organic peat. Vegetation in the Swamp is closely asspciated with topography, water inundation, and soils, and is more diverse and forested than it is in the Everglades. (Knapp-USGS)
W75-07863

BIOLOGICAL AND CHEMICAL ASPECTS OF THE SAN FRANCISCO BAY TURBIDITY MAXIMUM,
Geological Survey, Menlo Park, Calif.
T. J. Conomos, and D. H. Peterson.
In: Interrelationships of Estuarine and Continenal Shelf Sedimentation; Proceedings of International Symposium, Bordeaux, France, July 9-14, 1973: Memories de l'Institut de Geologie du Bassin d'Aquitaine, No 7, p 45-52, 1974. 8 fig, 14 ref.

Descriptors: *Sedimentation, *Bays, *Estuaries, *California, Sediment load, Sediment transport, Density currents, Water circulation, Tides.
Identifiers: *San Francisco Bay(Calif).

Suspended-particle composition and distribution in the San Francisco Bay system are modulated by seasonally varying water circulation, river inflow, and phytoplankton production. Water circulation has both tidal and nontidal component. The velocity of tidal components is as much as 250 cm/sec at Golden Gate. Tidal components, often reinforced by wind mixing, resuspend particles from the relatively shallow bay floor and move these particles laterally. Nontidal components, which are generated by wind and by density differences resulting from fresh-water inflows, are responsible for advective particle movements. These nontidal components are characterized by a permanent circulation cell in the north bay typical of a partially-mixed estuary, and by seasonally reversing flow in the south bay. Seaward surface drift of low-salinity water annually averages more than 6 cm/sec while landward near-bottom drift of ocean water annually averages 5 cm/sec. The pronounced estuarine circulation in north bay maintains a turbidity maximum which changes seasonally in particle concentration and composition. In contrast to north bay, the inherent weakness of south bay nontidal circulation precludes formation of a turbidity maximum. The bay system is an effective trap for suspended particles. Approximately 4 million metric tons of suspended particles accumulate annually in the bay system. (Knapp-USGS)
W75-07870

KARST HYDROLOGY OF NORTHERN YUCATAN PENINSULA, MEXICO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-07873

SOURCES OF SUSPENDED MATTER IN WATERS OF THE MIDDLE ATLANTIC BIGHT,
Geological Survey, Woods Hole, Mass.
For primary bibliographic entry see Field 2J.
W75-07875

MOVEMENT OF SPILLED OIL AS PREDICTED BY ESTUARINE NONTIDAL DRIFT,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5B.
W75-07877

NET TRANSPORT OF SEDIMENT THROUGH THE MOUTHS OF ESTUARIES: SEAWARD OR LANDWARD,
Geological Survey, Woods Hole, Mass.
R. H. Meade.
In: Interrelationships of Estuarine and Continental Shelf Sedimentation; Proceedings of International Symposium, Bordeaux, France, July 9-14, 1973: Memoires de l' Institut de Geologie du Bassin d' Aquitaine, No 7, p 207-213, 1974. 24 ref.

Descriptors: *Sediment transport, *Estuaries, *Provenance, Sediment yield, Continental shelf, Sedimentation, Sands, Rivers, Suspended load, Bed load.

Rivers and estuaries of the eastern U.S. may supply less sediment to the shelf than the shelf supplies to the estuaries. Evidences for transport of sediment onto the shelf from estuaries are: (1) net seaward drift of surface waters in estuaries and across the shelf; (2) plumes of turbid water that emerge from estuaries onto the shelf; and (3) measurements that suggest a net seaward transport of sediment through the mouth of Delaware Bay. Evidences of transport of shelf sediment into estuaries are: (1) net landward drift of bottom waters on the inner half of the shelf and in the estuaries, along with net longshore drift toward the mouths of the estuaries: (2) accumulation of fine sediment in estuaries in contrast with the prevalence of coarser relict material on the shelf; and (3) mineral compositions of estuarine sediments (and suspended sediment in shelf waters) that correspond more closely to older shelf sediments than to sediments being carried by rivers. The evidence that is presently available gives more support to a net landward movement of sediment from the shelf into the estuaries. (Knapp-USGS)
W75-07878

SEDIMENT DEPOSITION FROM FLOCCULATED SUSPENSIONS,
Bedford Institute of Oceanography, Dartmouth, Nova Scotia (Canada), Atlantic Oceanographic Laboratory.
For primary bibliographic entry see Field 2J.
W75-07892

EFFECTS OF SEA WATER EXTRACTS OF SEDIMENTS FROM CHARLESTON HARBOR, S.C., ON LARVAL ESTUARINE FISHES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
For primary bibliographic entry see Field 5C.
W75-07893

HYDROCARBONS IN THE MARINE ENVIRONMENT, I. N-ALKANES IN THE FIRTH OF CLYDE,
Torry Research Station, Aberdeen (Scotland).
For primary bibliographic entry see Field 5A.
W75-07894

NATURAL DISTRIBUTION OF TRACE METALS IN SEDIMENTS FROM A COASTAL ENVIRONMENT, TOR BAY, ENGLAND,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
D. Taylor.
Estuarine and Coastal Marine Science, Vol 2, No 4, p 417-424, October 1974. 5 fig, 3 tab, 11 ref.

Descriptors: *Trace elements, *Sediments, *Coasts, *Bays, Metals, Silts, Cadmium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Zinc, On-site investigations.
Identifiers: *England(Tor Bay).

The distribution of cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, and zinc, in the sediments of Tor Bay, a coastal area relatively free of industrial pollution, was investigated. The aim of this study was to provide baseline information which could be used for comparison with similar areas receiving industrial wastes. The trace metal concentrations and the percentage of silt in each sample were tabulated. Correlations between the elements were calculated. It was found that: (1) there are no significant correlations between manganese or mercury with any other element, and (2) the metal inter-relationships are complex. (Sims-ISWS)
W75-07895

DISTRIBUTION OF MICROBIAL ADENOSINE TRIPHOSPHATE IN SALT MARSH SEDIMENTS AT SAPELO ISLAND, GEORGIA,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W75-07899

SUBMERGED SOILS IN THE NORTHWESTERN MEDITERRANEAN SEA AND THE PROCESS OF HUMIFICATION,
Centre Universitaire de Perpignan, Moulin a Vent (France). Centre de Recherches de Sedimentologie Marine.
For primary bibliographic entry see Field 5B.
W75-07900

STOKES TRANSPORT BY GRAVITY WAVES FOR APPLICATION TO CIRCULATION MODELS,
Connecticut Univ., Groton. Marine Scinces Inst.
J. P. Ianniello, and R. W. Garvine.
Journal of Physical Oceanography, Vol 5, No 1, p 47-50, January 1975. 2 fig, 14 ref. NSF Grant GX-33502.

Descriptors: *Ocean circulation, *Gravity waves, *Model studies, Mathematical models, Currents(Water), Ocean currents, Mass transfer, Coriolis force, Oceanography, Mathematical studies.
Identifiers: *Stokes mass transport, Lagrangian transport.

Stokes mass transport by surface gravity waves is related to the often more interesting Lagrangian transport in a manner that is complicated by the earth's rotation. The conditions under which duration- and fetch-limited gravity wave transport will be important driving mechanisms for circulation models were discussed. Curves of duration and fetch-limited Stokes transport were given as functions of dimensionless time and fetch. (Sims-ISWS)
W75-07903

MODE: IGPP MEASUREMENTS OF BOTTOM PRESSURE AND TEMPERATURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 7B.
W75-07904

MODE BOTTOM EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 7B.
W75-07905

FORMATION OF MEANDERS, FRONTS, AND CUTOFF THERMAL POOLS IN A BAROCLINIC OCEAN CURRENT,
Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
B. Saltzman, and C-M. Tang.
Journal of Physical Oceanography, Vol 5, No 1, p 86-92, January 1975. 8 fig, 14 ref. NSF Grant GA-10555; Army Grant DAHC04-74-G-0229.

Descriptors: *Ocean currents, *Model studies, *Meanders, Ocean circulation, Mathematical models, Numerical analysis, Cyclones, Anticyclones, Oceanography.
Identifiers: *Baroclinic ocean currents, Gulf stream, Baroclinic instability, Fronts(Oceanic).

With an analytical model similar to that previously applied to the atmosphere, calculations were made showing how second-order, nongeostrophic effects can modify a two-layer baroclinic wave system that grows exponentially from a small perturbation in a uniform zonal ocean current. It was shown that many of the asymmetric features characteristic of meandering ocean currents

develop, including 'fronts' and cutoff cyclonic cold pools to the south and anticyclonic warm pools to the north of the axis of the mean current. The implication is that all of these features can be reviewed as being the simultaneous consequence of baroclinic instability (with attendant second-order finite-amplitude effects) of a broader, more uniform current that might tend to be forced externally by the wind stress and thermohaline processes. (Sims-ISWS)
W75-07906

ENTRAINMENT AND DIFFUSION IN A GULF STREAM CYCLONIC RING,
Texas A and M Univ., College Station. Dept. of Oceanography.
J. E. Schmitz, and A. C. Vastano.
Journal of Physical Oceanography, Vol 5, No 1, p 93-97, January 1975. 6 fig, 2 tab, 7 ref. ONR Contract N00014-68-0308-0002.

Descriptors: *Model studies, *Entrainment, *Diffusion, *Ocean circulation, Cyclones, Oceans, Temperature, Mathematical studies, Eddies, Oceanography, Atlantic Ocean.
Identifiers: *Cyclonic rings, Gulf Stream.

The mixing and entrainment processes present in a cyclonic ring was investigated by means of a parametric model which is fitted to serial temperature data for a North Atlantic ring. The physical model assumes an axially symmetric ring. Data from two cruises during the 1967 observation of a ring by the Woods Hole Oceanographic Institution provided estimates of the derivatives of the temperature. Upper bonds on the order of magnitudes were indicated for the diffusivities based upon near-minimum least-squares error estimates from regression analysis. An important result was that little different exists between a purely advective entrainment regime and those regimes including both entrainment and diffusion; i.e., the entrainment circulation appears to be the dominant mechanism in the temporal changes of the ring for a time scale of at least two months. The results provide streamline patterns for the transverse flow from the surface to 1000 m depth consistent with isotherm movement and changes in the ring water masses. (Sims-ISWS)
W75-07907

A THEORY OF STEADY WIND-DRIVEN CURRENTS IN SHALLOW WATER WITH VARIABLE EDDY VISCOSITY,
Rochester Univ., N.Y. Dept. of Mechanical and Aerospace Sciences.
For primary bibliographic entry see Field 2H.
W75-07908

DIFFUSION COEFFICIENTS CALCULATED FROM THE MEDITERREAN SALINITY ANOMALY IN THE NORTH ATLANTIC OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
G. T. Needler, and R. A. Heath.
Journal of Physical Oceanography, Vol 5, No 1, p 173-182, January 1975. 6 fig, 2 tab, 11 ref, 1 append.

Descriptors: Salinity, *Diffusion, *Atlantic Ocean, Sea water, Ocean circulation, Temperature, Model studies, On-site data collections, Oceanography.
Identifiers: *Mediterranean Sea, *Salinity anomaly, Austauch coefficients, Potential temperature, High-salinity tongue.

Vertical and horizontal austauch coefficients were obtained from standard station data on the Mediterranean high-salinity tongue by use of a simple model including advection by a constant velocity and three-dimensional diffusion. It was shown that background effects can be reduced by applying the model to the salinity anomaly relative to a linear potential temperature-salinity relationship. The analysis gave typical values for K sub H of 1.5 to 3 times 10 to the 7th power sq cm/s and for K sub V of 0.3 to 0.7 sq cm/s. It was argued that such values indicate the diffusion of potential density is not important in the main pycnocline of the North Atlantic anticyclonic gyre. (Sims-ISWS)
W75-07912

A NOTE ON OBSERVATIONS OF LONG-TERM TRAJECTORIES OF THE NORTH PACIFIC CURRENT,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 2E.
W75-07913

ELECTRONIC DIGITIZATION AND SENSOR RESPONSE EFFECTS ON SALINITY COMPUTATION FROM CTD FIELD MEASUREMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
G. I. Roden, and J. D. Irish.
Journal of Physical Oceanography, Vol 5, No 1, p 195-199, January 1975. 4 fig, 1 tab, 8 ref. ONR Contract N00014-67-A-0103-0014.

Descriptors: *Instrumentation, *Data processing, *Salinity, Conductivity, Temperature, Pressure, Data collections, Oceans, *Pacific Ocean, Oceanography.
Identifiers: Conductivity-temperature-depth sensors.

Spikes are often observed in salinity profiles computed from measurements of conductivity, temperature, and pressure. Many of these spikes are not real and are the result of a mismatch in the response functions of the sensors. Some of the spikes are also due to the sequential sampling technique used by most digitizers whereby the sensors are not sampled at the same time or position. Expressions were derived to linearly correct for these two causes of spikes. When the corrections were applied to measurements in the North Pacific, a significant reduction in the number and size of the spikes was observed in high gradient regions such as the thermocline. (Sims-ISWS)
W75-07914

THE WESTERN BOUNDARY UNDERCURRENT AS A TURBIDITY MAXIMUM OVER THE PUERTO RICO TRENCH,
Lamont-Doherty Geological Observatory, Palisades, N.Y.
For primary bibliographic entry see Field 2J.
W75-07918

HORIZONTAL SCALES IN THE MAIN THERMOCLINE DERIVED FROM THE TOPOGRAPHY OF A CONSTANT SOUND SPEED SURFACE BETWEEN BERMUDA AND THE ANTILLES,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2E.
W75-07919

OBSERVATIONS OF OCEANIC INTERNAL AND SURFACE WAVES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 7B.
W75-07920

OBSERVATION AND INTERPRETATION OF A HIGH-FREQUENCY INTERNAL WAVE PACKET AND SURFACE SLICK PATTERN,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2E.
W75-07921

THE DISTRIBUTION OF SALINITY AND TEMPERATURE IN THE CONNECTICUT RIVER ESTUARY,
Connecticut Univ., Groton. Dept. of Mechanical Engineering.
R. W. Garvine.
Journal of Geophysical Research, Vol 80, No 9, p 1176-1183, March 20, 1975. 9 fig, 1 tab, 6 ref. NOAA Grants NG-20-72, 04-3-158-62.

Descriptors: *Estuaries, *Temperature, *Salinity, *Connecticut River, On-site investigations, Measurement, Rivers, Sounds, Saline water-freshwater interfaces, Tides, Stratification, Seasonal, Physical properties, Chemical properties, Connecticut.
Identifiers: *Long Island Sound(Conn).

Measurements of near-surface salinity and temperature were made over a period of 16 months in the Connecticut River estuary, an estuary basically of the salt wedge type. The temperature distribution was found to be very highly correlated with the salinity distribution. The horizontal salinity distribution occurred primarily in two modes, a riverine mode and a plume mode, corresponding to salinity transitions mostly within the river itself and to those mostly within Long Island Sound. Similarity variables were developed for each of the two distribution modes which render the data in compact forms that should have applications to other estuaries of a similar type. (Sims-ISWS)
W75-07922

DETERMINING AMBIENT WATER TEMPERATURES,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
For primary bibliographic entry see Field 5B.
W75-07929

A CONTRIBUTION TO THE ECOLOGICAL STUDY OF A MOROCCAN ATLANTIC ESTUARY: THE ESTUARY OF BOU REGREG: I,
Institut Scientifique Cherifien, Rabat (Morocco). Lab. of Zoology.
B. Elkaim.
Bull Soc Sci Nat Phys Maroc, Vol 52, No 1/2, p 131-339, 1972. Illus.
Identifiers: Atlantic Ocean, Climates, Ecological studies, Estuaries, Morocco(Bou Regreg), Salinity, Sediments, Temperature, Turbidity, Hydrogen ion concentration.

All the physiochemical parameters involved in the ecology of the estuary at Bou Regreg were studied. The underlying geology, botanical cover, climatological conditions, salinity of water, temperature range, pH, turbidity and sediments are the factors presented in this phase of the study.--Copyright 1974, Biological Abstracts, Inc.
W75-07938

SHORT-PERIOD INTERNAL WAVES IN THE SEA,
For primary bibliographic entry see Field 2E.
W75-07976

A LINEAR THEORY OF INTERNAL WAVE SPECTRA AND COHERENCES NEAR THE VAISALA FREQUENCY,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 2E.
W75-07985

A BOTTOM CURRENT ALONG THE SHELF BREAK,
University of East Anglia, Norwich (England). School of Mathematics and Physics.
For primary bibliographic entry see Field 2E.
W75-07986

PHYTOPLANKTON CONCENTRATIONS IN THE MALAMOCCO CHANNEL OF THE LAGOON OF VENICE,
Istituto di Biologia del Mare, Venice (Italy).
For primary bibliographic entry see Field 5C.
W75-08063

THE ENVIRONMENTAL PROTECTION AGENCY AND COASTAL ZONE MANAGEMENT: STRIKING A FEDERAL-STATE BALANCE OF POWER IN LAND USE MANAGEMENT,
For primary bibliographic entry see Field 5G.
W75-08073

ON THE CHEMICAL MASS-BALANCE IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge, Mass. Dept. of Earth and Planetary Sciences.
For primary bibliographic entry see Field 5B.
W75-08095

SEASONAL CHANGES IN THE BIOMASS OF THE MACRO-BENTHOS OF A TIDAL FLAT AREA IN THE DUTCH WADDEN SEA,
Nederlands Instituut voor Onderzoek der Zee, Texel.
For primary bibliographic entry see Field 5C.
W75-08103

APPLICATION OF A MODEL TO AN ESTUARINE ECOSYSTEM,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
For primary bibliographic entry see Field 5C.
W75-08127

INITIAL COASTLINE PLAN FOR THE SAN DIEGO REGION,
Duncan and Jones, Berkeley, Calif. and San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6F.
W75-08171

RUNOFF FROM AN INTERTIDAL MARSH DURING TIDAL EXPOSURE - RECESSION CURVES AND CHEMICAL CHARACTERISTICS,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
L. R. Gardner.
Limnology and Oceanography, Vol 20, No 1, p 81-89, January 1975. 4 fig, 2 tab, 21 ref. OWRT B-055-SC(3).

Descriptors: *Tidal waters, *Tidal marshes, *Water quality, *Tidal streams, *Tidal effects, Silica, Phosphates, Bicarbonates, Runoff, Recession curves, Marshes, Tides, *South Carolina, Swamps, Coastal marshes, *Path of pollutants.

The runoff from marshlands during low tide exposure is enriched in dissolved silica, phosphate, and bicarbonate, and probably ammonia. These substances diffuse from the interstitial water reservoir of the sediment into a thin layer of seawater left on the surface of the marsh by the receding tide; during the period of exposure, this thin layer of enriched water drains from the marsh surface. The input of these substances to coastal waters by runoff from the marshlands of South Carolina is probably about equal to that supplied by freshwater runoff from the state. Thus marsh runoff may have an important effect on the concentration of nutrient elements in coastal waters. (Lee-ISWS)
W75-08193

A GALERKIN-FINITE ELEMENT TECHNIQUE FOR CALCULATING THE TRANSIENT POSITION OF THE SALTWATER FRONT,
Princeton Univ., N.J. Dept. of Civil and Geological Engineering.
For primary bibliographic entry see Field 5B.
W75-08195

ECOLOGICAL AND ECONOMIC PRINCIPLES IN PARK PLANNING: THE ASSATEAGUE NATIONAL SEASHORE MODEL,
National Park Service, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-08216

THE BACTERIOLOGICAL CONDITIONS OF SOME BELGIAN BEACHES (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W75-08224

DISTRIBUTION OF PLANKTON COMMUNITIES RELATED TO ENVIRONMENTS IN ADJACENT SEAS OF JAPAN: I. PLANKTON OF MIYAKO BAY OF RIKUCHU PROVINCE, (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan).
I. Yamazi, and T. Morita.
Bull Natl Sci Mus (Tokyo), Vol 15, No 2, p 347-384, 1972, Illus. English summary.

Descriptors: *Plankton, *Bays.
Identifiers: Chaetognaths, Ciliates, Cladocerans, Coelenterates, Copepods, Dinoflagellates, Ostracods, Polychaetes, Pteropods, *Japan(Miyako Bay).

The planktonic fauna and flora of Rikuchu Province of Tohoku district was studied in Miyako and Yamada Bays with different characters of topography and hydrography. Counts of populations at each station were made to obtain the quantitative estimates of number of various organisms/m3 of sea water. Both volume and number of plankton were characterized by abundance in the inner and central areas of the bays. The distribution of the communities varied and was correlated with the change of transparency, temperature, salinity and turbidity. They were also affected by the shape and depth of the sea floor, and the shape of the coast line, which produced the separate biological environments. The important groups in the bay were copepods, caldocerans, pelagic tunicates, larval forms of pelagic and benthic animals, coelenterates and tintinnid ciliates. Occasional groups were chaetognaths, crustacean barnacle nauplii and cypris forms. Neritic and oceanic copepods, pelagic tunicates and dinoflagellates occurred numerously from the mouth to the east and central areas of the central part of the bay, where the inshore natives and oceanic forms were mixed together. The fauna and flora in the bay were characterized by mixed communities of coastal warm water forms and oceanic warm water ones together with some northern natives. Copepods which appeared in abundance were neritic forms, such as Paracalanus parvus, Acartia clausi, Oithona nana, O. setigera Microsetella norvegica, Centrophages abdominalis. Inlet forms P. parvus, O. nana and O. similis were predominant. Cladocera were present, such as temperate species Evadne nordmanni and Podon leuckarti. Tunicates were the inlet and coastal form, Oikopleura dioica, and the open sea form, O. longicauda. Various larval forms of a number of pelagic and benthic crustacean groups appeared. Fairly numerous larvae were polychaetes, lamellibranch and gastropod veligers. There were 16 species of dinoflagellates identified.--Copyright 1973, Biological Abstracts, Inc.
W75-08239

SEASONAL FLUCTUATIONS OF THE MEIOBENTHOS IN AN ESTUARY ON THE SWEDISH WEST COAST,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5C.
W75-08271

TRACE METAL LEVELS IN THREE SUBTIDAL INVERTEBRATES,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
For primary bibliographic entry see Field 5B.
W75-08276

TILLAMOOK BAY MODEL STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08294

SAN DIEGO BAY MODEL STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08298

EFFECTS OF A STEADY NONUNIFORM CURRENT ON THE CHARACTERISTICS OF SURFACE GRAVITY WAVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08299

NECHES RIVER SALTWATER BARRIER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08301

FOOD HABITS OF GEORGIA ESTUARINE FISHES: I. FOUR SPECIES OF FLOUNDERS (PLEURONECTIFORMES: BOTHIDAE),
Skidaway Inst. of Oceanography, Savannah, Ga.
R. R. Stickney, G. L. Taylor, and R. W. Heard, III.
U S Natl Mar Fish Serv Fish Bull, Vol 72, No 2, p 515-525, 1974, Illus.
Identifiers: Ancylopsetta-quadrocellata, Bothidae, Citharichthys-spilopterus, *Estuarine fishes, Etropus-crossotus, Fish, *Flounders, *Georgia, Neomysis-americana, Pleuronectiformes, Polychaete, Pseudodiaptomus-coronatus, Scophthalmus-aquosus, Season, Size, Species, Stomach, *Food habits.

The food habits of 4 spp. of bothid flounders from Georgia coastal waters were examined by means of stomach content analyses. Ocellated flounders, Ancylopsetta quadrocellata (Gill); bay whiff, Citharichthys spilopterus (Gunther); and windowpane, Scophthalmus aquosus (Mitchill) fed heavily on the mysid shrimp, Neomysis americana, without regard to season of the year or location within the estuary. The food habits of both A. quadrocellata and C. spilopterus changed to some extent as the fish became larger. Organisms larger than N. americana dominated the stomach contents of A. quadrocellata larger than 150 mm standard length and C. spilopterus larger than 125 mm S. aquosus, in the size range examined, fed almost exclusively on N. americana. Fringed flounder, Etropus crossotus (Jordan and Gilbert) primarily consumed the calanoid copepod, Pseudodiaptomus coronatus, during the spring, summer and fall and diversified their food habits during winter. P. coronatus dominated the stomach contents both in the rivers and sounds of Georgia estuarine waters and was the dominant organism in fishes of all sizes up to 100 mm when polychaete annelids became important. The food of E. crossotus did not appear to vary with time of day; however, E. crossotus did not actively feed at night. The difference in food habits between E. crossotus and the other 3 bothid species appears to be associated with the relative size of the mouth.--Copyright 1974, Biological Abstracts, Inc.
W75-08324

NOTES ON THE WHITEFISH OF THE COLVILLE RIVER, ALASKA,
Alaska Dept. of Fish and Game, Fairbanks. Div. of Sport Fish.
K. T. Alt, and D. R. Kogl.
J Fish Res Board Can. Vol 30, No 4, p 554-556, 1973, Illus.
Identifiers: Alaska(Colville River), Coregonus-nasus, Coregonus-sardinella, Rivers, *Whitefish, Growth rates, Age, Deltas.

Five whitefish species are present in the Colville River, Alaska. Least cisco (Coregonus sardinella) was the most common species in the Colville Delta, while the broad whitefish (C. nasus) was most abundant at test net sites near Umiat. Limited age and growth data indicate slower growth than in interior Alaska waters.--Copyright 1973, Biological Abstracts, Inc.
W75-08333

FISH POPULATIONS OF THE AVON-HEATHCOTE ESTUARY: 3. GUT CONTENTS,
Tasmanian Dept. of Agriculture, Hobart (Australia). Sea Fisheries Div.
B. F. Webb.
N Z J Mar Freshwater Res. Vol 7, No 3, p 223-234, 1973, Illus.

Descriptors: *Estuaries, *Fish populations, Fish diets, Mullets, *Food habits.
Identifiers: Aldrichetta-forsteri, Arripis-trutta, Avon-Heathcote Estuary, Gobiomorphus-basalis, *New Zealand, Peltorhamphus-novaezeelandiae, Pseudolabrus-celidotus, Rhombosolea-leporina, Rhombosolea-plebeia, Selection, Spheroides-richei, Tripterygion-nigripenne, Flounder, Sole, Bully, Globefish, *Gut-content analysis.

Details are given of gut-content analyses for 9 fish species from the Avon-Heathcote Estuary, Christchurch, New Zealand: sand flounder, Rhombosolea plebeia; yellow-bellied flounder, R. leporina; common sole, Peltorhamphus novaezeelandiae; yellow-eyed mullet, Aldrichetta forsteri; kahawai, Arripis trutta; spotty, Pseudolabrus celidotus; cockabully, Tripterygion nigripenne; common bully, Gobiomorphus basalis and globefish, Spheroides richei. The percent occurrences of each food type recorded over the sampling period (April 1965-April 1966) for each species are compared. Monthly food tables are given for those species of which suitably large samples were obtained (sand flounder, yellow-bellied flounder, common sole, yellow-eyed mullet, and globefish). Where possible, the dietary occurrence of different food types is related to environmental and other factors observed or considered likely to influence food selection.--Copyright 1974, Biological Abstracts, Inc.
W75-08340

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PROCESS FOR PREPARING HEAVY WATER FROM SEA WATER,
H. Tabata, N. Tabata, and R. Nakajima.
U.S. Patent No 3,870,606, 7 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 932, No 2, p 629, March 11, 1975.

Descriptors: *Patents, *Heavy water, *Distillation, *Desalination, *Water quality control, *Salts, Sea water, Evaporation, Heat exchangers, Vaporization.

A process is described for preparing heavy water from sea water. It is comprised of adding 0.1-10.0 percent, calculated as Mg++ion of a soluble halide salt to a mixture of drains produced by the evaporation of sea water in a conventional process for the manufacture of common salt. The mixture of drains is warmed to between room temperature and 40 deg C using the heat energy from the salt manufacturing process. The warmed mixture of drains is concentrated to a heavy water content of about 1 percent by exposing large surface areas of the warmed mixture to the atmosphere, removing the added halide salt from the concentrated mixture by evaporating the mixture, and collecting the condensate from the evaporation step and subjecting the condensate to distillation to yield a high concentration heavy water. (Sinha-OEIS)
W75-07854

COMBINATION SOLAR AND MANUAL DISTILLER AND RAIN CATCHER,
Minoru Sakamoto.
U.S. Patent No 3,870,605, 4 p, 16 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 932, No 2, p 628, March 11, 1975.

Descriptors: *Patents, *Solar stills, *Desalination, *Distillation, Salt water, Brackish water, Separation techniques, Fresh water, Rain water, Equipment.
Identifiers: Rain catchers.

A still consists of a container that is provided with an opening on a cover that serves as a condensation surface. The cover is in the form of a hollow cone with an open base, an open apex and a rim around the base. An arcuate collecting trough is arranged adjacent the base and within the cone to receive the condensate which runs down the inner surface of the cone. The container is constructed from a heat-absorging material, and has at least its inner surface colored black. Condensate will run down the cover's inner surface under the influence of gravity and into the collecting trough. The rim of the cover is provided with a passage terminating in a lip and arranged for discharging condensate from the collecting. A vessel may be arranged on the base adjacent the terminal end of the passage for receiving condensate. (Sinha-OEIS)
W75-07856

WATER DESALINIZATION SYSTEM,
Lee (Raymond) Organization, Inc., New York. (assignee).
J. B. Swanson.
U.S. Patent No 3,871,180, 2 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 932, No 3, p 817, March 18, 1975.

Descriptors: *Patents, *Desalination, *Evaporation, *Condensation, *Water treatment, *Condensers, *Evaporators, Equipment, Salt water, Steam turbines, Electric generators.
Identifiers: Atomizers.

This desalination system consists of an atomizer, evaporator, accumulator, a steam turbine, an electric generator and a condenser. The electrical generator is coupled to and driven by the steam turbine. The atomizer, which is an air compressor, is connected to the generator. The compressed air is heated and directed at right angles to the flow of salt water. The evaporator is a circular vessel and has equiangularly spaced electodes. The consenser converts the steam to pure water after it drives the turbine. (Sinha-OEIS)
W75-07962

DESALTING TECHNIQUES FOR WATER QUALITY IMPROVEMENT.
American Water Works Association Research Foundation, Denver, Colo.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 977, $8.50 in paper copy, $2.25 in microfiche. Report INT-OSW-RDPR-75-1002, 1973. 257 p, 48 fig, 39 tab. O.S.W. 14-30-2864.

Descriptors: *Capital costs, *Desalination processes, *Estimated benefits, *Estimated costs, *Operating costs, *Water treatment, Brackish water, Desalination, Desalination apparatus, Desalination plants, Dissolved solids, Electrodialysis, Ion exchange, Municipal water, Reverse osmosis, Water purification, Water quality.

It is anticipated that municipal water consumption will continue to grow, and that consumers increasingly will demand improvements in water quality. The benefits of good quality water are not only reduced health hazards and greater aesthetic appeal, but also decreased operating and maintenance costs associated with the beneficial use of water connected facilities. Desalting techniques of electrodialysis, reverse osmosis and ion exchange are being used in a number of communities. These processes will not only improve the quality of a brackish water supply by removing dissolved solids, but also will remove some of the undesired minor elements which may be present in the intake water. The quality of water which is made available to the consumer can be improved by changing the municipal water supply--either by obtaining the water from a better source or by building a desalting or other water treatment plant. Information is presented which describes methods of improving the quality of brackish water supplies and which will permit preliminary estimates to be made of the tangible benefits of water quality improvement and of the capital and operating costs of conventional and desalting treatment plants. Local conditions will determine which alternative is best for each community.
W75-07998

3B. Water Yield Improvement

NATURAL AND MODIFIED PLANT COMMUNITIES AS RELATED TO RUNOFF AND SEDIMENT YIELDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4C.
W75-07866

TROUT RUN EARTHFILL DAM, BOROUGH OF BOYERTOWN, BERKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 8F.
W75-08030

HUNGRY HORSE CLOUD SEEDING PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bonneville Power Administration, Portland, Oreg.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-MT-73-2025-F, $8.75 in paper copy, $2.25 in microfiche. December 1973. 282 p, 6 fig, 14 tab, 5 chart.

Descriptors: *Energy, *Energy conversion, *Clouds, *Cloud seeding, Snowfall, Powerplants, Rain, Power operation and maintenance, *Montana, North America, River flow, *Weather modification.
Identifiers: *Environmental impact statements, *Flathead County(Mont), Lake County(Mont).

This action involves a cloud seeding project in Flathead and Lake Counties, Montana from December 1, 1973 through April 15, 1974. The purpose is to alleviate a projected energy shortage in the Pacific Northwest by helping assure normal streamflows and hydroelectric generation through the maintenance of normal snowpack conditions in the area. Environmental impact and effects include a possible increase of up to 10% in the 1973-74 winter season over a million acre target area. This increased participation may have minor, transitory impacts on wildlife, vegetation, soil ero-

sion, and streamflow. Inconvenience to local residents may occur; however, such effects are expected to be within natural snowfall variation ranges. A heavy late-season snowfall, combined with the seeding project, could result in a heavier-than-normal runoff. Some additional precipitation may be induced downland, possibly in the area of Glacier National Park. Alternatives to the seeding project, which will release about 13 pounds of silver iodide over the study area, were no cloud seeding program, with reduced consumption of electricity and use of other production sources; alternative methods of cloud-seeding including other seeding agents and use of airborne generators; cloud seeding of alternative areas; and delay of cloud-seeding operations. (Gerlach-Florida)
W75-08059

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
W. R. D. Sewell, and L. Roveche.
Natural Resources Journal, Vol 14, p 383-400 (1974). 18 p, 6 tab, 2 fig, 14 ref.

Descriptors: *Cities, *Water demand, *Water supply, *Water costs, *Pricing, Water management(Applied), Water conservation, Administration, Adoption of practices, Planning, Water shortage, Efficiencies, Costs, Economics, Water rates, Demand, Water allocation(Policy).
Identifiers: Seasonal prices, Peak demands.

A major economic and political issue in urban cities of North America and Western Europe is the problem of satisfying urban water demand. As a solution to the impending crisis in urban water management, a change is suggested from the traditional 'extensive' approach to an 'intensive' one. The former involves a progressive increase in the distance over which the city's water supply is obtained, while the latter method makes more efficient use of existing supplies. Several strategies are suggested to accomplish intensive use of existing supplies, such as imposition of water allocation regulations, implementation of water conserving technologies, or the treatment of waste waters. However, the most promising approach may be the use of pricing policies to encourage conservation. This alternative is discussed through a study of the time variable affecting urban demand for water and the resulting costs of supply. The application of seasonal prices, which would stimulate a reduction in peak demands, would promote a more continuous and economical use of water facilities. (Fernandez-Florida)
W75-08074

GERMINATION AND SEEDLING VIGOR OF SIX RANGE SPECIES IN RELATION TO MOISTURE STRESS AND TEMPERATURE,
Cairo Univ., Giza (Egypt). Dept. of Agronomy.
M. S. Radwan, A. H. Balleh, and E. H. Hattab.
Mesopotamia Journal of Agriculture, Vol 8, No 1, p 35-40, 1973. 2 fig, 1 tab, 5 ref.

Descriptors: *Grasses, *Germination, *Thermal stress, *Moisture stress, *Drought resistance, Air temperature, Planting management, Seed treatment, Viability, Drought tolerance, Revegetation, Ranges, Vegetation establishment, Clovers, Osmotic pressure.
Identifiers: Iraq, Saltbush, Mannitol solutions, Ryegrass, Lovegrass, Panicum, Burnet.

The influence of moisture stress on germination and seedling vigor of six range plants was studied at 20 and 30 degrees C., using mannitol solutions having osmotic pressures of 3 to 15 atm. Differences due to species, moisture and species X tension interaction were significant for relative germination percentage (as percent of germination at 0 atm.), shoot and root lengths. Fourwing saltbush was the species least sensitive to moisture stress. Germinability and seedling vigor of Lehmann Lovegrass, Panicum, and Small Burnet were considerably reduced as moisture tension increased above 5 atm. Reduction in germination was more pronounced at 20 degrees C. than at 30 degrees C. for all species except Small Burnet. The study is part of an effort to discover drought-resistant pasture plants for revegetating depleted range lands. (Bowden-Arizona)
W75-08111

RESULTS OF SPECIES, SPACING AND IRRIGATION FREQUENCY EXPERIMENT IN HAMMAN AL-ALIL AREA,
Mosul Univ. (Iraq). Dept. of Forestry.
For primary bibliographic entry see Field 3F.
W75-08114

BRUSHY BASIN-A FORMULA FOR WATERSHED MANAGEMENT SUCCESS,
Santa Ana Watershed Planning Agency, Calif; and Santa Ana Watershed Project Authority, Riverside, Calif.
For primary bibliographic entry see Field 4C.
W75-08196

DEVELOPMENT OF FOREST MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-08222

THREE SUCCESSFUL SALT TOLERANT PLANTS,
For primary bibliographic entry see Field 3C.
W75-08280

THE ANCIENT NAMIB DESERT,
For primary bibliographic entry see Field 2A.
W75-08288

3C. Use Of Water Of Impaired Quality

FATE AND EFFECTS OF TRACE ELEMENTS IN SEWAGE SLUDGE WHEN APPLIED TO AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-07852

POND WATER QUALITY IN A CLAYPAN SOIL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-07924

SPRINKLER IRRIGATION FOR LIQUID WASTE DISPOSAL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W75-07959

MUSKEGON, MICHIGAN,
Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 5D.
W75-07960

CHANGE IN THE CHEMISTRY OF NATURAL WATERS IN LANDSCAPES UNDER AGRICULTURAL USE,
For primary bibliographic entry see Field 5B.
W75-07974

GROUND-WATER QUALITY RELATED TO IRRIGATION WITH IMPORTED SURFACE OR LOCAL GROUND WATER,
Agricultural Research Service, Fresno, Calif.
For primary bibliographic entry see Field 5B.
W75-07978

SIMMONDSIA STUDIES AT THE NEGEV INSTITUTE,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
M. Forti.
Negev Institute for Arid Zone Research, Division of Life Sciences, Beer Sheva, June, 1973. 28 p, 5 tab, 2 fig, 12 ref.

Descriptors: *Plant breeding, *Cultivation, *Industrial crops, Irrigation practices, Salt tolerance, Agriculture, Fertilization, Seeds, Ecology, Arid lands, Variability.
Identifiers: *Simmondsia chinensis, *Israel(Negev).

The possibility of cultivating Simmondsia chinensis in the arid and semi-arid area in southern Israel was studied. The plant has a promising industrial potential for producing a liquid wax from its seeds. Preliminary results show that Simmondsia, after 10 years of experimental cultivation, can survive under a variety of agricultural practices. Yields were obtained in the third or fourth year after transplating, and production was good, although supplementary irrigation did increase yields. Attempts to cultivate Simmondsia under natural conditions in sandy soils have so far proved negative, but the species is moderately salt tolerant and cultivation might be possible in brackish water. Breeding prospects appear favorable for producing species adapted to the given conditions and agricultural practices. Harvest practices will have to be improved if the plant is to be used competitively. (Mastic-Arizona)
W75-08100

SANTIAGO-NORTE DRAINAGE PROJECT (CHILE),
F. E. Schultze, and M. G. Bos.
In: International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, Annual Report 1973. p 54-63, 7 fig, 1 tab.

Descriptors: *Irrigation, *Salinity, *Drainage systems, *Drainage wells, *South America, Flood frequency, Flood damage, Saturated soils, Irrigation systems, Water management(Applied), Evapotranspiration, Irrigation effects.
Identifiers: *Chile(Santiago-Norte Drainage Project).

An area covering 42,000 hectares at the northern end of the Central Valley has been irrigated for about forty years. Because two-thirds of the irrigation water is imported, natural equilibrium of the region has been altered. Also, irrigation practices employed are inefficient since only daytime flooding of fields is followed and there is no storage capacity or night flows. Natural stream beds in the area are not adequate for the huge amounts of water used in the valley, and flooding is endemic. The result of large imports of water and little or no planned drainage has been a rising groundwater table and salinization of soils. Geologic features of the valley accentuate this problem since groundwater has no escape from the area except by evapotranspiration. (Bowden-Arizona)
W75-08109

WATERLOGGING AND SALINITY PROBLEMS IN THE INDUS PLAIN (PAKISTAN),
R. Van Aart.
International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, Annual Report 1973. p 44-53. 7 fig, 3 tab, 3 ref.

Descriptors: *Salinity, *Saturated soils, *Drainage wells, *Dewatering, Irrigation, Irrigation systems, Saline water, Drainage systems, Wells, Water storage, Water management(Applied), Canals.
Identifiers: *Pakistan(Indus Plain).

Pakistan's Indus Basin is one of the world's largest irrigated areas with 33.5 million acres within the irrigation system, although only about 25 million acres actually receive water. This tract supplies 20 percent of Pakistan's foodstuffs and almost all of its cash crops. Since the introduction of irrigation in the middle of the nineteenth century, the area's water table has risen from 60 to 100 feet to a level in some fields of five feet. This waterlogging has led to salinization of the soils. Best estimates indicate 11 million acres to be waterlogged, 6 million acres salinized. Present tactics to increase agricultural production include storing surface water in reservoirs, enlarging canals, and utilizing groundwater and improving drainage through tubewells. Horizontal drainage is also receiving attention as a way to draw off saline groundwater. Some of these solutions are highly consumptive of energy; for example, the nation's 73,000 tubewells are either deisel or electrically powered. (Bowden-Arizona)
W75-08117

SEASONAL VARIATION IN SOME PHYSICAL, CHEMICAL, AND MICROBIOLOGICAL CHARACTERISTICS OF A SALINE AND A NON-SALINE SOIL NEAR ABU-GHRAIB, IRAQ,
Foundation of Scientific Research, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W75-08199

THREE SUCCESSFUL SALT TOLERANT PLANTS,
G. L. McPhie.
Journal of Agriculture, South Australia, Vol 76, No 1, p 5-8. February 1973. 8 fig.

Descriptors: *Halophytes, *Revegetation, *Saline soils, *Salt tolerance, *Vegetation establishment, *Australia, Erosion control, Grasses, Land reclamation, Soil stabilization, Erosion, Grazing, Saline water, Salinity, Summer, Winter, Wheatgrasses.
Identifiers: New South Wales, Seashore paspalum, Alakligrass.

Because saline areas represent an unproductive liability, susceptible to erosion and spreading, much recent research in Australia has been directed toward finding salt tolerant plants to stabilize salt-affected land. Now 3 salt tolerant perennial grasses have been found suitable for sowing in saline soils: Puccinellia capillaris; tall wheat grass, Agropyron elongatum; and salt water couch, Paspalum vaginatum. Puccinellia has been grown successfully on saline areas in South Australia, New South Wales, Western Australia, and Victoria, is a winter-growth pioneer on bare soil, self seeds easily, and once established survives moderate grazing. Tall wheat grass, a summer-growth plant in poorly drained soils, has been used not only to stabilize eroding lands but also for revegetation of salted areas in Victoria, Western Australia, and New South Wales. It withstands moderate grazing and may prove well adapted for reclamation and revegetation of salt lands in South Australia. Salt water couch is another summer-growth species well adapted to saline areas. Plant growth is creeping in habit, and plants spread rapidly by runners in moist soil. Once established, this perennial is highly resistant to grazing and has been used extensively for revegetation of saline land in South Australia, Victoria, and Western Australia, and in these regions, also, for lawns and greens irrigated with saline water. (Gloyd-Arizona)
W75-08280

WEST NUBARYA RECLAMATION PROJECT (EGYPT),
N. A. De Ridder.
In: International Institute for Land Reclamation and Improvements: Wageningen, The Netherlands. Annual Report, 1973, p 27-32. 4 fig, 1 tab.

Descriptors: *Saline water intrusion, *Irrigation systems, *Water management(Applied), *Model studies, *Drainage systems, Saline soil, Africa, Water quality, Land reclamation, Systems analysis, Cost-benefit analysis.
Identifiers: *Egypt(West Nubarya Reclamation Project).

The West Nubarya Reclamation Project, 50 kilometers southwest of Alexandria, is plagued by waterlogged fields and the intrusion of saline water into the irrigation canal. These problems must be solved if the salinity increase of the project's aquifer is to be brought under control. A systems approach is recommended for finding the optimum solution. Several subsystems (agricultural production, surface water distribution, groundwater and artificial drainage) must be incorporated into the model to enhance the predictive potential of the systems approach. From these studies, the need for artificial drainage and/or changes in the water distribution and supply systems will appear. The costs of these measures can then be compared with the benefits to the agricultural production subsystem and the optimum solution selected. (Bowden-Arizona)
W75-08285

HEMIDIEH-SHAUR PROJECT (KHUZESTAN, IRAN),
N. A. De Ridder.
In: International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands, Annual Report, 1973. p 41-43, 1 fig.

Descriptors: *Irrigation systems, *Saline water, *Saline soil, *Drainage programs, Watershed management, Surveys.
Identifiers: *Iran, Mesopotamian Plain.

Although the Hamidieh-Shaur project near Ahwaz, has been irrigated for fifty years, irrigation with poor quality water from the Karkheh River, following completion of the Karkheh Dam in 1954, has turned this arid land into a saline wilderness. Only in sections of the project where water can be used abundantly and where there is good natural drainage have farmers been able to grow crops with fairly good results, and even these yields are declining as soil salinity increases. The most likely solution to the problem is a master plan for optimum land and water management based on soil surveys, piezometer data, groundwater flow, and site tests, and the installation of a field drainage system in a major part of the area. (Bowden-Arizona)
W75-08286

3D. Conservation In Domestic and Municipal Use

WATER FACTS AND FIGURES FOR PLANNERS AND MANAGERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W75-07889

STATE-OF-THE-ART OF ESTIMATING FLOOD DAMAGE IN URBAN AREAS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-07939

MODAL CITIES,
Dartmouth Coll., Hanover, N.H. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W75-07967

ECONOMIC AND INSTITUTIONAL ANALYSIS OF COLORADO WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-07992

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-08215

3E. Conservation In Industry

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

WRINGING OUT THE WEST, REMEMBER THE MISSOURI AND THE COLORADO,
For primary bibliographic entry see Field 6D.
W75-08101

AN APPLICATION OF DISCRIMINANT ANALYSIS TO PREDICT INDUSTRIAL/COMMERCIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis.
For primary bibliographic entry see Field 6F.
W75-08208

THE RECLAMATION OF SULFURIC ACID FROM WASTE STREAMS,
New Jersey Zinc Company, Palmerton, Pennsylvania. Research Department.
For primary bibliographic entry see Field 5D.
W75-08228

COPPER RECOVERY FROM BRASS MILL DISCHARGE BY CEMENTATION WITH SCRAP IRON,
Anaconda American Brass Co., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W75-08229

CHLOR-ALKALI PRODUCERS SHIFT TO DIAPHRAGM CELLS,
J. C. Davis.
Chemical Engineering, Vol 81, p 84-87, February, 1974. 2 fig.

Descriptors: *Mercury, *Industrial waste, *Research and development, *Chlorine, Electrodes, Anodes, Asbestos, Inorganic compounds.
Identifiers: Japan.

The switch by chlor-alkali producers from mercury cells to diaphragm cells is discussed. Technological advancements have been made recently to make the synthetic cell produce almost as high quality a product as its mercury counter-

part. Japan is leading the way in making the change attributed mainly to public pressure. New developments by various companies, including the use of an electrode coating on the metal anodes (considered to be the single-most important energy conservation development) were discussed. (Jernigan-Vanderbilt)
W75-08235

3F. Conservation In Agriculture

UTILITY OF BROWN COAL FROM TUROW AND KONIN MINES AS THE SEEDBED IN HYDROPONIC CULTURES, (IN POLISH),
Wroclaw Univ. (Poland). Inst. of Botany and Biochemistry.
Z. Guminska, M. Gracz-Nalepka, B. Lukasiewicz, M. Leszner, and M. Slawska.
Acta Agrobot, Vol 26, No 1, p 63-88, 1973. English summary.

Descriptors: Europe, *Plant growth, *Vegetable crops, Coal mines, Hydroponics, Fertilization, Crop response, Plant-soil-water relationship.
Identifiers: Konin Mine, Turow Mine, Poland, *Brown coal, *Coal.

In experiments with vegetables and ornamentals, coal from both mines stimulated root growth and maintained Fe in soluble form. Better and earlier crops were obtained in hydroponic cultures than in pots filled either with soil or with coal watered with nutrient solution.--Copyright 1974, Biological Abstracts, Inc.
W75-07853

DRIPPING IRRIGATION TUBING,
J. Sahagun-Barragan.
U.S. Patent No 3,870,236, 4 p, 14 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 932, No 2, p 516, March 11, 1975.

Descriptors: *Patents, *Irrigation systems, *Water distribution(Applied), *Water conservation, Conduits, Pipes, Conservation, Agriculture, Tubes.
Identifiers: *Drip irrigation tubing.

A dripping irrigation tubing for distributing irrigation liquid is described. It comprises a pipe line having a plurality of spaced perforations along its length through which irrigation liquid under pressure emerges from the pipe line, and a one piece depressurizing channel member outside the pipe line which covers the perforations and extends partly around the external circumference of the pipe line. The channel includes a plurality of walls integrally attached to the bottom and each of the side walls of the channel in a alternate manner forming a fluid passage with a plurality of obstacles. This promotes the impingement of the irrigation fluid a great number of times thereby causing a substantial reduction in its pressure. The walls of the channel may be comprised of straight plates or else by a set of teeth tapered at the upper end and alternated to allow a change in the direction of the flow. The main pipe is a semirigid cylindrical pipe or a pipe made up of a laminar strip of flexible film sealed at its side edges to a wall of which the channel is attached. (Sinha-OEIS)
W75-07855

IRRIGATION RUNOFF RECOVERY IN THE DESIGN OF CONSTANT FURROW DISCHARGE IRRIGATION SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
G. E. Stringham, and S. N. Hamad.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 79-84, January-February 1975. 3 fig, 2 tab, 4 ref.

Descriptors: *Irrigation, *Irrigation design, *Irrigation engineering, *Furrow irrigation, Irrigation systems, Agricultural engineering, Furrow systems, Runoff.
Identifiers: *Irrigation runoff recovery, *Constant furrow discharge, Cut-back irrigation.

A method was presented to design an Irrigation Runoff Recovery System which will permit a constant furrow discharge throughout the irrigation set by irrigating the first set entirely from supply water, the last set entirely from pumped runoff water, and by varying the set size between the two. Since the system requires a variable number of furrows from set to set, a table and charts were presented to give the number of furrows required in successive sets, number of sets required, number of furrows in the late set irrigated entirely from stored runoff, storage volume required, potential water savings, area covered by the storage pond, and recirculating-pump flow rate. (Terstriep-ISWS)
W75-07923

WATER AND SALT TRANSFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W75-07925

IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.
Food and Agriculture Organization of the United Nation, Rome (Italy). Committee on Agriculture.
Report COAG/74/4, Rev 1, April 1974. Presented at 16th Food and Agriculture Organization of the United Nations Conference, Rome, Italy, April 17-30, 1974. 82 p, 19 tab, 5 maps.

Descriptors: *Arid lands, *Agriculture, *Productivity, *Water supply, *Rainfall, Crop production, Development, Land use, Land development, Resource development, Livestock, Soils, Research and development, Arid climates, Semiarid climates, Social aspects, Economic impact.

The significance of low rainfall areas in terms of land use, productivity, and population is described. Quantitative indicators for the level of development and the socio-economic disparities as compared with the other areas of the world are presented. Indicators of the level of agricultural performance are also discussed. Some general measures for the development of these areas are considered. Proposals are presented for further FAO assistance to member countries involved. Maps of the arid and semiarid zones show types of soils; a brief description of each type is provided. A list of international agricultural research centers is given along with a description of their purposes and programs. This study is a first attempt to place the problem of improving productivity in low rainfall areas in perspective on a world-wide scale. An effort has been made to identify these areas, determine their scope and importance, identify constraints limiting production, and develop, specify and evaluate plans by which these constraints may be overcome and improvement brought about. (Mastic-Arizona)
W75-07981

FLOW AND RETENTION OF WATER IN THE STRATIFIED SOILS OF THE OROVADA, NEVADA, AREA,
Nevada Univ., Reno. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W75-07991

A DYNAMIC WATER AND RELATED LAND RESOURCE PLANNING MODEL: ITS APPLICATION TO AN HAWAIIAN WATER SYSTEM,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W75-07993

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: IRRIGATED AGRICULTURE WATER USE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
G. T. Thompson.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 974, $4.75 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Report No 17 c, September 1974. 80 p, 7 fig, 7 tab, 22 ref. OWRT B-036-WASH(5), B-043-WASH(4), B-050-WASH(4).

Descriptors: *Model studies, *Systems analysis, Computer models, Planning, Water management(Applied), Agricultural runoff, Watershed management *Washington, Water rights, Irrigation water, Water utilization, Costs, Consumptive use, Irrigation efficiency.
Identifiers: *Yakima River basin(Wash).

A model was developed that provides a basis for determining water usage and costs of using water for irrigation of agricultural crops. The model determines monthly consumptive use and water division requirements needed to irrigate a given cropping pattern on a watershed. Provided in the model is a technique to determine the monthly return flow occurring from an irrigated watershed. The model provides for determining the irrigation needs and return flows from each of any number of sub-areas which may be used to define a watershed. The model is designed to provide options of increasing irrigation efficiencies, changing cropping patterns, or reducing irrigated areas during low flow years. The model is developed to provide the irrigation components of an overall hydrologic model of a watershed.
W75-07994

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: WATER QUALITY MODELING,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-07995

PHYSIOLOGICAL APPROACH TO THE ANALYSIS OF SOME COMPLEX CHARACTERS OF POTATOES,
Ceskoslovenska Akademie Ved, Trebon. Lab. of Algology.
J. Necas.
Potato Res, Vol 17, No 1, p 3-23, 1974. Illus.
Identifiers: Breeding, *Genotypes, *Growth stages, *Phenotypes, *Physiological studies, *Potatoes, Transpiration, Crop production.

An attempt was made to show the possibility of analysis of the phenotypic as well as genotypic make-up of 2 complex physiological characters of cultivated potatoes. The complex characters were the yielding capacity and the water relations. The components of the 1st were analyzed for some potato varieties by the method of growth analysis. For the analysis of their water relations the ability to retain water in the plant tissues and to regulate its output by transpiration were determined. It was shown that in different potato varieties the make-up of the complex characters studied may differ. It is possible to design, for practical breeding purposes, model (type) plants with regard to the phenotypic as well as genotypic make-up of both the complex characters mentioned.--Copyright 1974, Biological Abstracts, Inc.
W75-08008

INSTITUTIONAL CONSTRAINTS ON AGRICULTURAL WATER USE,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 6E.
W75-08013

SIMMONDSIA STUDIES AT THE NEGEV INSTITUTE,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
For primary bibliographic entry see Field 3C.
W75-08100

DRIP IRRIGATION FOR REVEGETATING STEEP SLOPES IN AN ARID ENVIRONMENT,
American Smelting and Refining Co., Sahuarita, Ariz.
For primary bibliographic entry see Field 4D.
W75-08102

YIELDS AND WATER-USE EFFICIENCIES OF DRYLAND WINTER WHEAT AND GRAIN SORGHUM PRODUCTION SYSTEMS IN THE SOUTHERN HIGH PLAINS,
Southwestern Great Plains Research Center, Bushland, Tex.
O. R. Jones.
Soil Science Society of America, Proceedings, Vol 39, No 1, p 98-103, January-February, 1975. 4 tab, 2 fig, 13 ref.

Descriptors: *Water conservation, *Crop production, *Dry farming, *Farm management, *Great Plains, Texas, Water utilization, Runoff, Sorghum, Wheat, Terracing, Slopes, Erosion.

The effects of conservation bench terraces, bench terraces, and common systems on dryland production of winter wheat and grain sorghum were studied in terms of grain yields and water-use efficiencies. Grain production and water-use efficiency were highest on a bench terrace cropped in continuous grain sorghum. Conservation bench terraces with continuous grain sorghum also had higher water-use efficiencies and grain production than the common dryland systems of wheat-sorghum-fallow, continuous wheat, or wheat-fallow. In the Southern High Plains dryland grain production systems are available to increase grain production and water-use efficiencies while providing adequate control of wind and water erosion. Crop selection and land leveling are management factors that greatly influence water-use efficiencies and conserve potential runoff. (Mastic-Arizona)
W75-08105

GRAZING SYSTEMS FOR ARIZONA RANGES.
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
Arizona Interagency Range Committee, 1973. 36 p, 3 fig, 3 tab, 23 ref, 2 append.

Descriptors: *Arizona, *Forage grasses, *Grazing, *Range management, *Livestock, Ranges, Environmental effects, Land use, Plant growth, Productivity, Range grasses, Revegetation, Soil conservation, Vegetation re-growth, Water conservation, Wildlife conservation.

Since the most common grazing system now used in Arizona is yearlong or seasonal grazing, no rest is afforded the range to regain its vigor, set seed, and allow regeneration of the most favored forage plants and areas. In August 1973, a field study of 8 Arizona ranches showed that use of grazing systems is still quite limited even though research and experience have demonstrated that livestock must be forced to graze according to a carefully developed plan using all available range management techniques and skills which simultaneously will suit the needs of the rancher, the livestock, and the range itself. Proper management of Arizona's native rangeland and grazeable woodlands, which comprise the major portion of the total land area of the state, is directed now toward maximum production of desirable forage species, optimum plant density and vigor, adequate mulch cover, greater water infiltration, reduced soil-surface evaporation, minimum soil erosion, and reduced sediment pollution. Improvement of grazing lands is essential to quality environment, and increased demands for multiple use of these lands make it imperative that they be managed to yield the food, fiber, high-quality water, recreation, wildlife, and other benefits within their capability. (Gloyd-Arizona)
W75-08112

DESERT FARMERS: ANCIENT AND MODERN,
Hebrew Univ., Jerusalem (Israel). Dept. of Botany.
M. Evenari.
Natural History, Vol 83, No 7, p 42-49, August-September, 1974. 5 fig (part col), 3 ref (p 100).

Descriptors: *History, *Agricultural runoff, *Demonstration farms, *Irrigation systems, *Rainfall-runoff relationships, Crop production, Deserts, Experimental farms, Rainfall, Runoff, Alfalfa, Annual, Arid lands, Field crops, Grasses, Horticultural crops, Irrigation, Nuts, Pastures, Soil-water-plant relationships.
Identifiers: *Israel(Negev Desert).

Some 1400 years ago in the Negev Desert of Israel ancient farmers cultivated extensive crops by irrigation with runoff rainfall. In 1959, after painstaking field research, two ancient farm catchment systems at Avdat and Shivta were reconstructed to test this method. Data collections made over 15 years with modern rain-measuring instruments recorded the 1-7 inch rainfall variability typical of arid lands. Each year, however, enough catchment water was collected to keep fruit trees, perennial pasture plants and vegetables alive, though annual field crops could not be planted during 4 years when drought conditions prevailed. Certain varieties of almonds and pistachios proved the most promising vegetable crop. Annual crops grown included cereals, legumes, oil and fiber plants. Of perennial pasture plants tested, Harding grass, smilo grass, and several alfalfas proved best adapted to this type of agriculture. Loess soil was the most favorable for runoff farming; testing of microcatchments revealed surface runoff yields amounting to 62 percent of the rainfall. A third farm, established in 1970 in Wadi Mashash south of Beersheba, serves as a pilot demonstration and training center for desert runoff agriculture. Although receiving only 5-6 inches of rainfall annually for its 2000 almond, 500 olive, and 300 pistachio trees, this farm has shown that microcatchment runoff farming is practical and can be used on a large scale in other arid countries. (Gloyd-Arizona)
W75-08113

RESULTS OF SPECIES, SPACING AND IRRIGATION FREQUENCY EXPERIMENT IN HAMMAN AL-ALIL AREA,
Mosul Univ. (Iraq). Dept. of Forestry.
M. S. Kettaheh.
Mesopotamia Journal of Agriculture, Vol 8, No 2, p 171-177, 1973.

Descriptors: *Irrigation efficiency, *Water management(Applied), *Drought tolerance, *Plant growth, *Moisture stress, Irrigation, Irrigation practices, Irrigation water, Pllication methods, Water demand, Forest management, Frequency, Drought resistance, Planting management, Reforestation, Spatial distribution, Vegetation establishment, Trees, Pine trees.
Identifiers: *Iraq, Eucalyptus, Cypress, Casurina.

To aid Iraqi foresters in tree-planting programs carried out in the more arid areas of the country, studies were undertaken on the effect of irrigation frequencies on two species, Eucalyptus camaldulensis and Pinus brutia. Weekly irrigation was more beneficial for seedling survival than less frequent schedules. The eucalyptus height growth also was enhanced by weekly irrigation, although the pine reacted about the same to the three irrigation frequencies: weekly, bi-weekly, or monthly. Three plant spacings (5x2, 5x4, and 5x6 meters) had little effect on either survival or height growth. Two additional species, Cupressus sempervirens var. horizontalis and Casurina equisetifolia, were found to be less drought resistant than the eucalyptus or the pine. (Bowden-Arizona)
W75-08114

BIOGENIC AND INORGANIC SOURCES FOR ICE NUCLEI IN THE DROUGHT-STRICKEN AREAS OF THE SAHEL--1974,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2B.
W75-08115

AN INTEGRATED NATURAL RESOURCES SURVEY IN NORTHERN IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
R. N. Kaul.
Nature and Resources, Vol 9, No 2, p 13-17, April-June, 1973. 1 fig.

Descriptors: *Arid lands, *Crop production, *Land resources, *Rainfall, Arid climates, Land use, Natural resources, Sierozems, Vegetation, Water resources, Desert plants, Land management, Land reclamation, Regional development, Soil investigations, Surveys, Water supply, Water use.
Identifiers: *Iraq, Economic development.

In the Tel-Afar/Sinjar region a broad reconnaissance of climate, soils, water, and vegetation disclosed that both the land and vegetation resources have been improperly utilized. Many hazards are involved in the rain-fed cultivation of wheat and barley, while extensive farming coupled with low soil fertility and a failure to use positively the area's natural assets have resulted in low productivity. There is now a need for the conservation of natural resources from further degradation. It is important, therefore, that development plans which may vary considerably from traditional practices in this area, be based on careful research having the following emphases: a study to balance land use between rain-fed agriculture and range farming, restricting cultivation to Iraq's most suited regions; establishment of a network of meteorological stations to develop long-range forecasting; a study of rainfall and its effectiveness in various land-use situations; an investigation of the hydrology of the Jebel Singar area to establish current effectiveness of water use and to examine the possibility of increased ground-water exploitation; a study of soils, their physical and chemical characteristics, fertility, and soil-water relationships to develop sound soil-management practices; and finally, where the original natural vegetation remains, development of rehabilitation techniques for the management and use of these large areas. (Gloyd-Arizona)
W75-08116

MICROMORPHOLOGY OF TWO SOIL PROFILES IN FUDHALIYAH,
Foundation of Scientific Research, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W75-08118

THE PROTECTIVE EFFECT OF SUGARS ON CHLOROPLAST MEMBRANES DURING TEMPERATURE AND WATER STRESS AND ITS RELATIONSHIP TO FROST, DESICCATION AND HEAT RESISTANCE,
Duesseldorf Univ. (West Germany). Botanical Inst.
K. A. Santarius.
Planta (Berl) Vol 113, No 2, p 105-114, 1973, Illus.

Descriptors: *Membranes, *Biological membranes, *Stress, Thermal stress, Water stress, Freezing, Drying, *Protection, Frost, Heat re-

sistance, Drought resistance, Winter killing, Resistance, Environmental control.
Identifiers: Chloroplasts, Desiccation, Glucose, Heat, Phosphorylation, Spinacia-Oleracea, *Sucrose, Thylakoids, *Spinach, Trisaccharide raffiniose, Disaccharide sucrose, Photophosphorylation.

Freezing, desiccation and high-temperature stress may under certain conditions result in inactivation of electron transport (DCIP reduction) and cyclic photophosphorylation of isolated chloroplast membranes of spinach (Spinacia oleracea L.). When sugars are present during temperature and water stress, the thylakoids may be partially or completely protected. This membrane stabilization depends on the concentration of sugars and their molecular size. The trisaccharide raffinose is, on a molar basis, more effective than the disaccharide sucrose and the latter more than the monosaccharide glucose. An uncoupling effect and a stimulation of electron transport can be observed during freezing, desiccation and heat treatment, e.g. electron transport reactions are less sensitive to temperature and water stress than is photophosphorylation. As sugars are known to accumulate in winter, unspecific membrane stabilization by sugars may help to explain the often reported parallel development of frost, drought and heat resistance in many plants during winter.--Copyright 1974, Biological Abstracts, Inc.
W75-08242

MOISTURE MODIFICATION SHELTERS FOR EPIDEMIOLOGICAL STUDIES OF FOLIAR DISEASES,
Georgia Univ., Athen.
For primary bibliographic entry see Field 2I.
W75-08245

COMPONENTS ANALYSIS OF YIELD RESPONSES TO DROUGHT OF SORGHUM HYBRIDS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
A. Blum.
Exp Agric, Vol 9, No 2, p 159-167, 1973. Illus.
Identifiers: *Components analysis, Drought resistance, Grains, Hybrids, Panicle, Soil moisture, *Sorghum-bicolor, Tillering, *Crop production.

Drought resistance in terms of yield and its components was studied in the field in 21 agronomically-adapted high-performance grain sorghum (Sorghum bicolor Moench) hybrids. Resistance was considered to be indicated by a minimal decrease in yield under stress as compared with non-stress conditions. Water stress, imposed by a decreasing amount of stored soil moisture during the growing season, decreased grain yield and number of panicles per unit area, increased the number of grains per panicle, the number of branches per whorl and the number of grains per branch, and decreased the number of whorls per panicle. Thus, a compensatory effect was observed in some components for reduction in tillering under stress. Resistant hybrids performed better than susceptible ones under stress by producing a relatively higher number of panicles per unit area, and more grains per panicle branch. Susceptible hybrids performed better than resistant ones under nonstress (irrigated) conditions due to the relatively higher number of panicles per unit area and larger 1000-grain weight. Some of the implications regarding selection for yield performance under drought are discussed.--Copyright 1973, Biological Abstracts, Inc.
W75-08265

THE EFFECT OF SOIL MOISTURE TENSION AND NITROGEN SUPPLY ON NITRATE REDUCTION AND ACCUMULATION IN WHEAT SEEDLINGS,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
Z. Plaut.
Plant Soil, Vol 38, No 1, p 81-94, 1973. Illus.
Identifiers: Dry matter, Leaf, Minerals, *Nitrate reduction, *Nitrogen, Nutrition, Production, Reductase, Seedlings, *Soil moisture tension, *Wheat seedlings, Absorption.

Nitrate reductase activity was inhibited when soil moisture tension was increased to about 3.0 bars associated with a drop in leaf relative water content to about 90%. The decrease in nitrate reductase activity did not result in nitrate accumulation in short-term experiments (10 days) when plants were exposed to only 1-2 cyclies of elevated soil moisture tensions. However, when the period of different moisture regimes was extended up to the flag-leaf stage, nitrate accumulated in stressed plants. Significant increase in plant nitrate concentration as a result of increased moisture tensions was only found at the high levels of added N. On the other hand, moisture tensions had no effect on the content of total N in wheat shoots, implying that nitrate reduction was rather limiting under stress conditions. An effect of soil moisture tension and N nutrition on dry matter production by wheat seedlings was also found in the long-term experiment. At the highest dose of soil N an increase in maximal soil moisture tension from 0.1 to 0.33 bars reduced plant growth; at intermediate N doses only tension higher than 2 bars reduced growth. Under complete N deficiency, plant dry matter production was very low and was not affected by soil moisture tensions.--Copyright 1973, Biological Abstracts, Inc.
W75-08266

UTILIZING CLIMATE-MOISTURE-WATER USE RELATIONSHIPS IN IMPROVING SOIL MOISTURE BUDGET METHOD FOR IRRIGATION SCHEDULING,
Punjabrao Krishi Vidyapeeth, Akola (India). Dept. of Agronomy.
For primary bibliographic entry see Field 2D.
W75-08275

SUBDIVISION ON MALLEE FARMS,
For primary bibliographic entry see Field 4A.
W75-08281

WEST NUBARYA RECLAMATION PROJECT (EGYPT),
For primary bibliographic entry see Field 3C.
W75-08285

HEMIDIEH-SHAUR PROJECT (KHUZESTAN, IRAN),
For primary bibliographic entry see Field 3C.
W75-08286

DRIP IRRIGATION,
D. W. Armstrong, and P. J. Cole.
Journal of Agriculture, South Australia, Vol 77, No 1, p 2-9, February, 1974. 14 fig.

Descriptors: *Irrigation systems, *Soil moisture, *Soil-water-plant relationships, *Surface irrigation, Australia, Plant growth, Root zone, Costs, Fertilizers, Labor, Horticultural crops, Irrigation practices, Trickling filters, Tubes, Water conservation.
Identifiers: *Drip irrigation.

Recent experiments applying drip irrigation to fruit trees and vines in Victoria have stimulated interest in this method. Advantages lie in supplying water to plant root zones at a very low uniform rate, thus maintaining soil moisture for optimum growth. With this method, rapid growth and increased yields are noted, as well as water savings, since evaporation and runoof losses are virtually eliminated. Furthermore, weed growth is minimal, over-irrigation is avoided, and relatively saline water and saline soil, as well as low water pressure, may be utilized. Labor savings may results, particularly in comparison with portable irrigation systems. Disadvantages include limitations on fertilizer application, leaching of fertilizers from sandy soils, accumulation of salts at the edge of the wet zone, blocking of drippers and filters, and restrictions of root zone growth, especially with trees. Commercially produced systems are available in Australia, or a home-made system may be assembled by using a polyethylene microtubing, thus reducing costs. (Gloyd-Arizona)
W75-08287

GRASS FOR CONSERVATION: II. THE QUALITY OF A SECOND CUT TAKEN AFTER SIX WEEKS GROWTH,
National Inst. of Agricultural Botany, Cambridge (England).
J. W. Dent, and D. T. A. Aldrich.
J Natl Inst Agric Bot, Vol 12, No 2, p 340-346, 1971.

Descriptors: *Conservation, *Grasses, *Plant growth, *Water requirements.
Identifiers: Cocksfoot, Fescue, Italian ryegrass, Timothy, *Climatic effects.

If the 1st cut is taken under dry conditions and is followed by a period of drought, regrowth is slow, but a period of rain later in the 6-wk period may result in late and rapid growth producing material of high digestibility. The reverse may also occur with moist conditions early in the period. This may result in the early growth, deteriorating in quality towards the end of the 6-wk growth period. Climatic conditions are likely to be the main cause of site differences both in yield and quality. In most species a 2nd conservation cut taken 6 wk after the 1st cut at an estimated 63D (digestibility level) gave material at an acceptible level of quality. With the exception of Italian ryegrass and cocksfoot digestibility levels were about 65-67D. In all cases the Italian ryegrass was of low digestibility and this was probably due to the high proportion of heads in the sward. Despite site differences in digestibility, the low coefficients of variation indicated a satisfactory degree of reproducibility in variety comparisons. In 1969 significant differences between varieties were found in perennial ryegrass, timothy and meadow and tall fescue, with an average least significant difference (P = 0.05) of 1.9% of D-value.--Copyright 1973, Biological Abstracts, Inc.
W75-08343

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: II. EFFECT ON CHLOROSIS DEVELOPMENT, AND SOME NUTRIENT ELEMENT CONTENTS IN SOIL AND PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
For primary bibliographic entry see Field 2G.
W75-08344

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

IDENTIFICATION AND ANALYSIS OF SELECTED HIGH PRIORITY WATER PROBLEMS AND RELATED RESEARCH NEEDS OF THE MISSOURI RIVER BASIN,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W75-07851

RECONNAISSANCE OF SEDIMENTATION IN THE UPPER RIO BERMEJO BASIN, ARGENTINA,
Geological Survey, Menlo Park, Calif.

For primary bibliographic entry see Field 2J.
W75-07859

FLORIDA'S WATER RESOURCES,
Geological Survey, Tallahassee, Fla.
C. S. Conover.
Reprint of paper from 'The Dare Report-1973': University of Florida Institute of Food and Agricultural Sciences Publication 11, 1973. 10 p, 5 fig, 8 ref.

Descriptors: *Water resources, *Florida, Groundwater, Surface waters, Hydrogeology, Water utilization, Water demand.

The use of freshwater in Florida in 1970 for all purposes averaged about 5.8 billion gallons per day, equivalent to about 850 gallons per day per person. The mean annual runoff of streams in Florida is about 40 billion gallons a day, equivalent to an average of 14 inches over the surface of the state. This amount is only about 7 times the amount of freshwater used in 1970 in Florida but is about 22 times the amount used consumptively. The Floridan aquifer consists essentially of solution-riddled limestone that lies beneath the land surface throughout nearly all of Florida. The aquifer is at or near land surface in the northern and central part of the peninsula, and is at depths of more than 1,000 feet in the southern part of the peninsula. The aquifer system contains a tremendous volume of freshwater in storage, about 800 cubic miles. Saltwater contamination is rather common in some areas, especially in southwestern Florida, where salty artesian water has been allowed to infiltrate, via leaky well casings, into shallow aquifers which contained fresh water, such as in the vicinity of LaBelle and in parts of Lee County. A common cause of saltwater encroachment in Florida, especially along the southeast coast, has been the construction of canals. (Knapp-USGS)
W75-07872

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 1. SURFACE WATER RECORDS.
Geological Survey, Lincoln, Nebr.
For primary bibliographic entry see Field 7C.
W75-07879

WATER BALANCE OF LAKE KERR--A DEDUCTIVE STUDY OF A LANDLOCKED LAKE IN NORTH-CENTRAL FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 2H.
W75-07881

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF NORTHEASTERN WYOMING, 1974-75.
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-07887

WATER FACTS AND FIGURES FOR PLANNERS AND MANAGERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W75-07889

FLOOD PLAIN MANAGEMENT AND IMPLEMENTATION STRATEGIES FOR FPM PROGRAMS,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6F.
W75-07890

OPTIMAL MONTHLY OPERATION OF INTERCONNECTED HYDROELECTRIC POWER STORAGES,
Institute of Hydrology, Wallingford (England).
A. I. McKerchar.
Journal of Hydrology, Vol 25, No 1/2, p 137-158, April 1975. 7 fig, 10 tab, 19 ref.

Descriptors: *Dynamic programming, *Hydroelectric plants, *Reservoir operation, Streamflow, *Thermal powerplants, Synthetic hydrology, Storage, Inflow, *Optimization, Computers, *Simulation analysis, Analytical techniques, *Model studies.
Identifiers: Interconnected power storages, *New Zealand, Multivariate streamflow model.

In water resource systems problems, the conceptual part consists of formulating the design of a system as a set of mathematical functions and the computational part comprises optimization of the objective function by solving the system equations recursively. A deterministic dynamic programming technique coupled with a multivariate streamflow simulation model was developed for operation of two interconnected reservoirs in the South Island of New Zealand. The releases from these reservoirs are used for hydroelectric power generation, but plants are operated in conjunction with thermal generating plants to provide a specified energy load for each month. The system objective is to minimize the expected present value of the thermal generating costs. A real-time operating policy which specifies a planned release for each month as a function of the quantities of water stored at the beginning of each month was developed. Important advantages of this particular dynamic programming approach over other optimizing techniques were illustrated; in particular, good account was taken of the stochastic nature of the inflows. (Singh-ISWS)
W75-07898

IRRIGATION RUNOFF RECOVERY IN THE DESIGN OF CONSTANT FURROW DISCHARGE IRRIGATION SYSTEMS,
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W75-07923

SEISMIC RESPONSE OF RESERVOIR-DAM SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-07930

COMPUTATION OF STAGE-DISCHARGE RELATIONSHIPS AFFECTED BY UNSTEADY FLOW,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 2E.
W75-07932

STATE-OF-THE-ART OF ESTIMATING FLOOD DAMAGE IN URBAN AREAS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and O. J. Helweg.
Water Resources Bulletin, Vol 11, No 2, p 379-390, April 1975. 8 fig, 19 ref.

Descriptors: *Flood damage, *Damages, *Floods, *Cities, Drainage, Flood control, Land use, Management, Planning, Zoning, Stage-discharge relations, Discharge frequency, Legislation, Estimating.

With implementation of the Flood Insurance Act of 1968 many additional local flood protection projects are being considered. Consulting engineers and local agencies need consistent methods to estimate flood damage in order to perform feasibility studies. Federal agencies have a great deal of data and long experience in making damage estimates but no comprehensive guides are available at the local level. Curves of flood damage to different residential structure types were presented. The relationships in use by the U.S. Federal Insurance Administration were shown to be reasonable and were recommended for use as approximate guides. Additional research was recommended and discussion of the paper was invited in order to make additional data available in the literature. (Dawes-ISWS)
W75-07939

DRAINAGE CHARACTERISTICS OF SOILS,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-07944

COMMENTS ON THE HISTORY OF CONTROLLED BURNING IN THE SOUTHERN UNITED STATES,
Tall Timbers Research Station, Tallahassee, Fla.
E. V. Komarek, Sr.
In: 17th Annual Arizona Watershed Symposium, Proceedings, September 19, 1973, Phoenix, p 11-17, 34 ref.

Descriptors: *Burning, *Forest management, *History, Range management, Wildlife management, Watershed management, *Southeast U.S.
Identifiers: *Controlled burning.

Controlled or prescribed burning in the Southeastern United States is used for the management of forest, range, and wildlife. Early in this century the Dixie Pioneers scientifically approached the burning question and established the modern precedents. Today the Tall Timbers Research Station operates for public, scientific, and educational purposes. Their publications, research, and seminars are designed to aid the control of an ecological balance. (McLachlan-Arizona)
W75-07977

WATER RESOURCES DEVELOPMENT BY THE U.S ARMY CORPS OF ENGINEERS IN ARIZONA,
Army Engineer District, San Francisco, Calif.
January, 1973. 65 p, illustrated, map.

Descriptors: *Flood control, *Floodwater, *Arizona, *Historic floods, *Colorado River Basin, Engineering structures, Diversion structures, Canals, Flood plain zoning, Flood recurrence interval, Recreation, Recreation facilities, Lakes, Damsites, Dams, Watershed management.
Identifiers: Gila River Basin(Ariz), Little Colorado River Basin(Ariz).

A history of the Army Corps of Engineers activities in Arizona is given as well as brief sketches of future projects. Basically, the Corps sees its work as flood control. Recreational facilities created by the projects are also described. The Corps has been active in the state since the middle of the nineteenth century. The state is divided into three sections in the volume, Lower Main Stem Subregion, Gila Subregion, and Little Colorado Subregion. Corps participation in civil works also is described. (Bowden-Arizona)
W75-07979

ESTIMATING LAND USE CHARACTERISTICS FOR HYDROLOGIC MODELS,
Rummel, Klepper and Kahl, Baltimore, Md.
W. R. Gluck, and R. H. McCuen.
Water Resources Research, Vol 11, No 1, p 177-179, February 1975. 2 tab, 9 ref. OWRT A-025-MD(1).

Descriptors: *Land classification, *Land use, *Urban mapping, *Model studies, Watersheds(Basins), Rainfall-runoff relationships, Urban hydrology, Suburban areas, Hydrology, Equations, *Estimating.

Equations for estimating land use characteristics used in many hydrologic models were presented. The method presented was intended as a reliable alternative to the more costly, time-consuming process of aerial photography interpretation. Application of the equations permits prediction of future land use configurations. Data input takes the form of demographic characteristics (e.g., population density of housing density) which is frequently available from planning agencies or others. (Jess-ISWS)
W75-07982

A STOCHASTIC DYNAMIC PROGRAMMING MODEL FOR THE OPTIMUM OPERATION OF A MULTI-PURPOSE RESERVOIR,
California Univ., Los Angeles.
M. Torabi, and F. Mobasheri.
Water Resources Bulletin, Vol 9, No 6, p 1089-1099, December 1973. 3 fig, 3 tab, 7 ref, 1 append. OWRT B-091-CAL(2).

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Dynamic programming, *Stochastic processes, *Analytical techniques, Statistical methods, Streamflow, Decision making, Powerplants, Monte Carlo method, Markov processes, Mathematical models, *California.
Identifiers: *Folsan Reservoir(Calif), Transition matrix.

The unreliability of forecasting the amount of future streamflow makes the problem of reservoir operation a stochastic process. The stochastic nature of the streamflow was taken into account by considering the correlation between the streamflow of each pair of consecutive time intervals. This interdependence was used to calculate the probability of transition from a given state and stage to its succeeding ones. A dynamic programming model with a physical equation and a stochastic recursive equation was developed to find the optimum operational policy of a single multipurpose reservoir. The model was applied to a real surface water reservoir system. (Singh-ISWS)
W75-07988

WATER RESOURCES PLANNING, SOCIAL GOALS AND INDICATORS: METHODOLOGICAL DEVELOPMENT AND EMPIRICIAL TEST.
Utah State Univ., Logan. Technical Committee of the Water Resources Research Center of the Thirteen Western States.
For primary bibliographic entry see Field 6B.
W75-07997

THE IMPACT OF HIGH INTEREST RATES ON OPTIMUM MULTIPLE OBJECTIVE DESIGN OF SURFACE RUNOFF URBAN DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W75-08001

AN OPTIMAL POLICY FOR OPERATING A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C.
C. B. Russell.
Operations Research, Vol 20, No 6, p 1181-1189, November-December, 1972. 1 fig, 1 ref. OWRR A-018-SC(2).

Descriptors: *Multiple-purpose reservoirs, *Reservoir operation, *Operating costs, *Water allocation(Policy), *Dynamic programming, Optimization, Operations research, Mathematical models, Equations, Theoretical analysis, Electric power, Downstream, Flow.
Identifiers: *Optimal operating policy, Reservoir levels, Power demand.

An analytically determined general optimal policy for operating a multi-purpose reservoir is presented and depicted in graphical form. Piecewise linear cost functions are used to describe downstream flow costs, reservoir level costs, and costs incurred in meeting and not meeting power demands, the cost parameters involved in these functions being left arbitrary to allow wide applicability. Assumed are random inflows into the reservoir, known power demands, and the availability of a finite-capacity auxiliary power source. Dynamic programming is used as an analytical, as opposed to numerical, tool in determining the general form of an optimal operating policy for this model. A general solution to the problem of water allocation in a multipurpose reservoir is obtained. (Bell-Cornell)
W75-08003

FLOOD PROTECTION BENEFITS AS REFLECTED IN PROPERTY VALUE CHANGES,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 6F.
W75-08004

RIVER BASIN WATER PLANNING ORGANIZATIONS IN THE 60'S,
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-08011

SIXES BRIDGE DAM AND LAKE, MARYLAND AND PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8F.
W75-08015

CORBELL HULL DAM AND RESERVOIR, CUMBERLAND RIVER, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 8A.
W75-08020

GUADALUPE RIVER, TEXAS (REMOVAL OF LOG JAMS) (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
March 29, 1973. 90 p, 1 map 8 ref.

Descriptors: *Flood control, *Barriers, *Obstruction to flow, Navigation, Floods, Project planning, Project benefits, *Texas, Ecosystems, Aquatic habitats, Pollutants, Smoke, Silting, Water policy, Federal project policy.
Identifiers: *Environmental Impact statements, *Guadalupe River(Tex), Log jams.

The removal of log jams on the Lower Guadalupe River, Texas, has been examined with respect to its engineering feasibility, environmental impact, and conformity with the intent expressed by Congress. Jams now partially restrict the river flow, so that small and moderate floods overlap its banks, flooding adjacent lowlands and obstructing small boat navigation. Their removal will provide immediate benefits by preventing damage from small and frequent floods, and by increasing production and improving utilization of agricultural land. Larger and less frequent flooding will be appreciably affected. Four major log jams and a log raft, as well as any other jams which might develop, will be removed with disposal of the debris by burning at an estimated cost of $390,000. Air pollution from the burning, release of small amounts of accumulated settlement with consequent downstream siltation and elimination of spawning and feeding habitats for aquatic species will result. However, these environmental effects, which are minor and mainly temporary, are far, outweighed by the benefits expected to be received from the project. The proposed action is fully consistent with national policy, statutes, and administrative directives. (Ostapoff-Florida)
W75-08021

SHOAL CREEK CHANNEL, CHARITON-LITTLE CHARITON BASINS, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kanasa City, Mo.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-MO-73-0793-F, $4.25 in paper copy, $2.25 in microfiche. March 1973. 72 p, 3 map, 4 tab.

Descriptors: *Flood control, *Flood protection, *Channel improvement, Wildlife, Recreation, Flow, Drainage, Streams, Recreation facilities, Floods, Flooding, Environmental effects, Channels, *Missouri, Wetlands, Flood damage, Forestry, Forests.
Identifiers: *Environmental impact statements, *Putnam and Schuyler Counties(Mo).

The project involves construction of a flood control project, consisting of 2.4 miles of channel improvement and a high flow channel in Putnam and Schuyler Counties, Missouri. The project will provide flood protection, improve drainage, alter 2.8 miles of stream habitat, and remove wildlife habitat along the high floe channel. The loss of approximately 2.8 miles of natural character of the Shoal Creek and associated stream biota and adjacent wildlife will be the main adverse effect of the project. Additional damage to wildlife habitat will occur in the area along the high flow channel, if constructed. In addition, the provision of flood protection and drainage will encourage local farmers to encroach upon timberlands. The project will also cause temporary adverse effects on the environment during construction. The following alternatives were considered: alternate channelization alinements; small watershed flood detention developments; and no action. (Gagliardi-Florida)
W75-08024

FOURMILE RUN LOCAL FLOODPLAIN PROTECTION, CITY OF ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-VA-73-06-4-F, $5.25 in paper copy, $2.25 in microfiche. April 1973. 116 p, 13 tab, 9 map, 3 fig, 7 plate.

Descriptors: *Virginia, *Flood protection, *Flood control, *Channel improvement, *Drainage systems, Channels, Walls, Levees, Drainage, Flood frequency, Flood forecasting, Flooding, Floods, Bridge design, Bridges, Aesthetics, Planting management, Recreation facilities, Recreation, Marshes, Environmental effects, Vegetation, Flood plain zoning.
Identifiers: *Environmental impact statements, Alexandria(Va), Arlington County(Va).

The project involves changes in a local flood protection project including revisions to flood frequency, channels, walls, levee dimensions and computations; alterations to interior drainage facilities; additional bridge modifications; and inclusion of recreation, beautification and enhancement programs. The revised project will enhance easthetics by elimination of portions of walls and levees and by addition of plantings. Additionally, recreational opportunities will be increased and portions of existing marshland will be preserved. Among adverse effects expected are elimination of additional streamside vegetation, reduction in the amount of active recreation space, disturbance of shallow stream bottoms and the use of 3.6 acres of low quality marshland for spoil area. The following alternatives were considered: providing a

low degree of protection with improved channel and dredge modifications; supplementary flood plain management; and walls and levees in addition to the proposed project. (Gagliardi-Florida)
W75-08025

HAMPTON CREEK NAVIGATION PROJECT (MAINTENANCE DREDGING) HAMPTON, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-VA-73-0745-F, $3.75 in paper copy, $2.25 in microfiche. November 1972. 40 p, 2 tab, 2 map, 1 fig.

Descriptors: *Dredging, *Navigation, *Virginia, *Channel improvement, Channels, Commercial fishing, Aquatic habitats, Benthic flora, Benthic fauna, Fish eggs, Water pollution sources, Waste disposal, Landfills, Recreation, Spawning, Fish populations, Commercial fish, Environmental effects.
Identifiers: *Environmental impact statements, *Hampton Creek(Va), Hampton Roads(Va).

Maintenance dredging of the 150 foot - 200 foot wide entrance channel of the Hampton Creek navigation project to the required 12-foot depth will maintain the carrying capacity of the project for the efficient movement of commercial and recreational navigation. 126,000 cubic yards of spoil will be removed from the area of Old Point Comfort to the mouth of Hampton Creek, a tidal estuary of Hampton Roads, Virginia. The spoil willbe transported 7 nautical miles to the Craney Island Disposal Area, used in 1967 in an earlier maintenance project. Turbidity from the dredging will not be sufficient to result in an increase over the normal estuarine level by any significant percentage. There will not be any notable adverse effects on primary production, respiration, or spot attachment. However, the buoyancy of pleustonic fish eggs will be reduced by the attachment of silt particles on their outer membrane, resulting in a local reduction in fish production. Comments received on submission of the Draft Environmental Impact Statement led to the conclusion that dredging should not commence until after the spawning season terminates, in early winter. With this revision, adverse environmental effects of the project will be minimal. In view of the extensive use of the channel by the local seafood industry, the alternative of foregoing maintenance is unacceptable. (Ostapoff-Florida)
W75-08026

CENTRAL AND SOUTHERN FLORIDA PROJECT, LAKE OKEECHOBEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-FL-73-1765-F, $6.25 in paper copy, $2.25 in microfiche. November 8, 1973. 164 p.

Descriptors: *Florida, *Environmental effects, *Water supply development, Water level fluctuations, Federal government, Water supply, Water management(Applied), Lakes, Water quality, Water resources development, Water storage, Dependable supply, Multiple-purpose projects, Potential water supply, Reservoir operation, Dams, Water levels, Saline water intrusion, Levees, Potable water, Flooding.
Identifiers: *Environmental impact statements, *Lake Okeechobee(Fla), Dam effects.

This project is one of six segments of the Central and Southern Florida Project. Lake Okeechobee is a natural lake located in south-central Florida, and it is the second largest body of fresh water in the United States, having a surface area of 730 square miles. This segment consists of raising the regulation range of the lake from 14.0 to 15.5 feet, mean sea level, to 15.5 to 17.5, mean sea level. About 85% of the facilities needed to effect this raise are already completed. The remaining facilities, consisting of various levees, spillways, and locks, will be completed as part of this segment. The raise will increase the present storage capability in the lake approximately 900,000 acre-feet, providing additional water to supply all project purposes, including Everglades National Park. The raise will also periodically inundate 12,000 acres of lake bottom currently being used for pasture and agriculture, resulting in improved ground-water quality in areas adjacent to the lake and some change in location, density, and distribution of aquatic vegetation. While no significant permanent adverse environment effects are anticipated, portions of several recreational facilities will be inundated. The alternative of increasing storage capability in several other water conservation areas was rejected as impractical or not environmentally viable. Approximately 22,000 acres of upland vegetation will be convereted to marsh habitat. Concern was expressed by various groups that possible adverse environmental effects were not adequately considered. (Deckert-Florida)
W75-08027

LAKEVIEW LAKE, MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Forth Worth, Tex.
For primary bibliographic entry see Field 8A.
W75-08028

SOUTH FORK WATERSHED, PAWNEE AND RICHARDSON COUNTIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-08029

ARKANSAS RIVER AND TRIBUTARIES ABOVE JOHN MARTIN DAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N.Mex.
For primary bibliographic entry see Field 8A.
W75-08033

SPRING BROOK WATERSHED, LANGLADE AND MARATHON COUNTIES, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-WI-73-1416-F, $4.25 in paper copy, $2.25 in microfiche. August 28, 1973. 70 p, 1 photo, 1 graph, 4 tab, 3 map.

Descriptors: *Flood protection, *Flood control, *Watershed Protection and Flood Prevention Act, *Wisconsin, Watershed management, Flooding, Floods, Environmental effects, Sedimentation, Erosion, Erosion control, Spillways, Dams, Forests, Dikes, Trees, Vegetation, Wildlife, Channels, Flood plain zoning.
Identifiers: *Environmental impact statements, Antigo(Wisc).

The project involves watershed protection and flood prevention in Langlade and Marathon Counties, Wisconsin, to be implemented under authority of the Watershed Protection and Flood Prevention Act. The primary environmental effects of the action will be the reduction of the annual rate of erosion by up to 50 percent and the average annual sedimentation rate by about 12 percent. Additionally, average annual flood damages will be reduced by about 41 percent on agricultural land, 47 percent on roads and bridges, and 46 percent in the city of Antigo. Structural measures will reduce the frequency of flow through Skinner Dam's auxillary spillway to less than once in 50 years and will regulate the flow of Spring Brook and stabilize Antigo Lake. The proposed installation of the dam, spillway, and sediment pool will remove about 17 acres of forest and 108 acres of cropland from production. Additional adverse environmental effects include removal of trees along the channel and in the vicinity of the dike; temporary removal of 71 acres of vegetation; and the subjection of 35 acres of forest land, 385 acres of cropland, and associated wildlife habitat to occasional short duration flooding. The alternatives are to continue the present trends; accelerated the land treatment; accelerate the land treatment in connection with channel enlargements; and utilize programs of floodproofing, flood plain zoning, and structure removal in the flood plain. (Gagliardi-Florida)
W75-08035

CHANNEL EXTENSION, SIUSLAW RIVER AND BAR, LAND COUNTY, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 8A.
W75-08043

NAVIGATION SEASON EXTENSION DEMONSTRATION PROGRAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-MI-73-1933-F, $8.75 in paper copy, $2.25 in microfiche. December 14, 1973. 285 p, 10 map, 9 tab.

Descriptors: *Navigation, *Great Lakes, *St. Lawrence Seaway, *Ice, Iced lakes, Ice cover, Powerplants, Ice jams, Ships, Navigable waters, Navigable rivers, Winter.
Identifiers: *Environmental impact statements, Navigability tests.

The Navigation Season Extension Demonstration Program is part of a three-year program to demonstrate the practicability of extending the commercial navigation season on the Great Lakes and St. Lawrence Seaway. The following potential extension methods were considered: bubbler systems; ice breaking activities; ice retarding heat additives in the form of power plant heat rejections; and ice stabilization and retention structures. Also investigated were modifications, vessels designed to increase ice navigation capabilities and various types of navigational aids to permit safer navigation during winter weather conditions. The purpose of the demonstration program is to establish the feasibility of this alternative to limited winter use. (Gagliardi-Florida)
W75-08044

RED RIVER WATERWAY, LOUISIANA, TEXAS ARKANSAS, AND OKLAHOMA, AND RELATED PROJECTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-08045

AUTHORIZED GRANITE REEF AQUEDUCT, CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8A.
W75-08050

VERONA DAM AND LAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8F.
W75-08056

CHANNEL TO NEWPORT NEWS, VIRGINIA (MAINTENANCE DREDGING) (ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 8A.
W75-08057

SANTIAGO-NORTE DRAINAGE PROJECT (CHILE),
For primary bibliographic entry see Field 3C.
W75-08109

GRAZING SYSTEMS FOR ARIZONA RANGES.
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 3F.
W75-08112

AN INTEGRATED NATURAL RESOURCES SURVEY IN NORTHERN IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 3F.
W75-08116

WATERLOGGING AND SALINITY PROBLEMS IN THE INDUS PLAIN (PAKISTAN),
For primary bibliographic entry see Field 3C.
W75-08117

EPA AUTHORITY AFFECTING LAND USE,
Ross, Hardies, O'Keefe, Babcock and Parsons, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-08172

SPECIAL FLOOD HAZARD REPORT: CHESTER CREEK, GREATER ANCHORAGE AREA,
Army Engineer District, Anchorage, Alaska.
Prepared for the Greater Anchorage Area Borough, Alaska, January, 1975. 19 p, 2 tab, 24 plates.

Descriptors: *Floods, *Flooding, Flow, *Obstructions to flow, *Glaciation, *Alaska, Flood plains, Flood frequency, Flood water, Flood flow, Velocity.
Identifiers: *Chester Creek(Alas), Anchorage(Alas), Greater Anchorage Area Borough, Intermediate Regional Flood, Standard Project Flood.

The study area extends from the confluence of Chester Creek with Knik Arm to the foothills of the Chugach Mountains. Stream flows westward to and through Anchorage (population over 162,500). Flood plain has limited commercial development. Within Anchorage portions of the flood plain have been designated as a green belt for recreational development although parts of this area have been flooded previously. Rapid residential development in formerly damp and swampy areas and on both sides of the Creek is creating problems due to increased runoff and accelerated main channel flow. Floods occur in spring and winter from thaws and winter glaciation where water will freeze down to the stream bed forcing water on top of the ice sometimes creating a new water course. Culverts are a major obstruction to flow and a primary site for the glaciation process. Installation of trash racks upstream of culverts is suggested to reduce culvert plugging from debris. Regular inspection of all culverts and trash racks to remove debris is necessary. No structures or regulations exist for flood control. Latest major floods occurred in April, 1963 with others in November, 1961, April, 1966, and August, 1971, the first two due to ice conditions causing backwater effects. The Intermediate Regional flood and the Standard Project Flood would cause greater damage as channel velocities approach 12 ft/sec causing erosion and transporting materials. Glaciation or winter flooding is a constant and ever-increasing threat and should always be considered before any development near the stream. Glaciation may possibly extend beyond IRF limits shown on plates. Intended as a suitable basis for future study, no solutions to flood problems are provided. (Park-North Carolina)
W75-08173

FLOOD PLAIN INFORMATION: CROW CREEK, CHEYENNE, WYOMING,
Army Engineer District, Omaha, Nebr.
Prepared for City of Cheyenne, June, 1970. 24 p, 4 fig, 5 plates, 2 tab.

Descriptors: Floods, *Flooding, *Flood damage, *Obstructions to flow, Flood data, *Flood plains, Flood water, Maximum probable flood, Historic floods, *Wyoming.
Identifiers: *Crow Creek(Wyoming), Cheyenne(Wyoming), Intermediate Regional Flood, Standard Project Flood.

The drainage area of Crow Creek, a tributary of the South Plate River, is 253 sq mi including the southern portion of Cheyenne. The Creek provides the city with its water supply and sewage disposal. Study area extends from interstate Highway 25 downstream 6.3 miles to sewage disposal plant. Most of the channel has been straightened and confined by roads, levees, and fills and drops about 18 ft/mi in slope. Industrial, commercial and residential development in the flood plain is gradual but steady with pressures for development likely to continue. Eleven bridges cross the creek, possible obstructions to major flood flows. Elevated roadways and inadequate culverts also create problems. Intense thunderstorm rainfall during spring and summer months possibly preceded by heavy snowmelt causes most floods. Although it has been almost 40 years since the last major flood, June, 1929, future floods of the same size are still possible. Intermediate Regional Flood with a peak discharge of 5,500 cfs would overtop all bridges except on Highway 25 and the railroad bridges, covering an area about 600 ft wide upstream of Morrie Avenue. A Standard Project Flood with an estimated peak discharge of 17,000 cfs would inundate about 1,000 ft in the same reach. The depth of flood water, together with the rapidly rising waters, and high velocities can cause substantial damage to industrial, commercial, and residential areas. Recommendations for flood protection are not included. (Park-North Caolina)
W75-08174

FLOOD PLAIN INFORMATION: SAN DIEGO CREEK AND PETERS CANYON WASH, ORANGE COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
Prepared for Orange County Flood Control District, June, 1972. 28 p, 17 fig, 6 tab, 21 plates.

Descriptors: Floods, *Flood plains, *Flood profiles, *Flood forecasting, Flood frequency, *Flooding, Flow, Obstructions to flow, Flow characteristics, Flood data, Flood damage, Tributaries, Historic floods, *California, Velocity.
Identifiers: Orange County(Cal), Newport Beach(Cal), Irvine(Cal), *San Diego Creek(Cal), *Peters Canyon Wash(Cal), Intermediate Regional Flood, Standard Project Flood.

Study area includes portions of the cities of Newport Beach and Irvine and the 80,000 acre Irvine Ranch. Development pressures have created intense demand for industrial and residential land. A planned development projected over 20 years anticipates 280,000 people and the University of California at Irvine expects an enrollment of 27,500. San Diego Creek and its major tributary, Peters Canyon Wash, drain an area of approximately 150 sq mi within Orange County ranging in elevation from sea level to about 1700 feet above mean sea level. Stream gradients range about 4 ft/mi upstream of Newport Bay to about 25 ft/mi near upstream study limits. Channels of both streams are well defined and have long reaches of improvements. Runoff is very erratic varying from almost no flow for long periods to rapid increases following heavy rains. The flood plain area currently used for agriculture is expected to become increasingly urbanized in the next decades. Most flooding has been caused by high-intensity rainfall from winter storms November through March. Trees and vegetation obstruct channels. Some channel improvements aid in flood control. An adequate system of channels and storm drains must be provided for the City of Irvine. In February, 1969, the most devastating flood of record had a peak flow of 6,700 cfs on San Diego Creek for a drainage area of 40.3 sq mi with losses on the Creek estimated at $1,157,000. The Intermediate Regional Flood and Standard Project Flood could have peak flows of 11,600 cfs and 21,000 cfs respectively and would inundate large areas with bridges and roads rendered impassable from deposits of debris and erosion. (Park-North Carolina)
W75-08175

FLOOD PLAIN INFORMATION: MARAIS DES CYGNES RIVER, MELVERN TO OTTOWA, KANSAS, VOLUME 1.
Army Engineer District, Kansas City, Mo.
Prepared for Kansas Water Resources Board, July 1973. 32 p, 20 fig, 5 tab, 19 plates.

Descriptors: *Floods, *Flooding, *Flood plains, *Flood profiles, *Flood forecasting, Flood flow, Obstructions to flow, Flood peak, Flood discharge, Historic floods, Maximum probable flood, *Kansas.
Identifiers: *Marais Des Cygnes River(Kansas), Salt Creek(Kansas), One Hundred and Ten Mile Creek(Kansas), Ottowa(Kansas), Intermediate Regional Flood, Standard Project Flood.

Development in the flood plain of the River and two main tributaries, Salt Creek and One Hundred and Ten Mile Creek, is minimal, mostly undeveloped and agricultural. A portion of Ottowa, Kansas is in the flood plain but is protected by a system of levees and flood walls completed in 1962. Additional protection is afforded by two reservoirs, Melvern Lake and Pomona Lake controlling 650 square miles of the River's 1250 square mile basin. Past major floods occurred in November, 1928, April, 1944, and July, 1951 with peak discharges at Ottowa of 87,400, 73,000, and 142,000 cubic feet/second (cfs) respectively. Flood flows result mainly from rapid runoff from intense rainfall. Floods from local runoff below the lakes and from floodwaters through the lake spillways are possible through the entire study area. The 1973 flood on the Maria de Cygnes River had an estimated discharge or 12,500 cfs at Ottowa and was above flood stage there for 7 days. Possible future floods, the Intermediate Regional Flood (IRF) and Standard Project Flood (SPF) would have respective peak flows of 78,000 cfs and 114,000 cfs at river mile 400.7, an IRF cresting at 898.5 ft and inundating 9 bridges, an SPF cresting at 902.4 ft and inundating eight more bridges. Channel velocities could reach as high as 5.78 ft/sec in an IRF and 6.25 ft/sec in an SPF at a point on the Marais des Cygnes near Pomona, causing severe streambank erosion and eroding bridge abutments. Operation of the reservoirs, Melvern and Pomona Lakes are expected to reduce flood stage to about 3 days. No recommendations for flood control are included. (Park-North Carolina)
W75-08176

FLOOD PLAIN INFORMATION: SALT CREEK, RIVERSIDE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08177

FLOOD PLAIN INFORMATION: SALT CREEK, RIVERSIDE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
Prepared for Riverside County, June, 1971. 30 p, 23 fig, 3 tab, 18 plates.

Descriptors: Floods, *Flood plains, *Flood profiles, *Flood forecasting, *Flooding, *Flood damage, Maximum probable flood, Historic floods, *California.
Identifiers: *Salt Creek(Cal), Riverside County(Cal), Hemet(Cal), Sun City(Cal), Intermediate Regional Flood, Standard Project Flood.

Salt Creek, a tributary of the San Jacinto River, drains 130 sq mi from its headwaters (elevation 4500 ft) near the City of Hemet to Railroad Canyon Reservoir near Sun City. Traversing largely agricultural areas, the natural watercourse has been virtually obliterated and floods have been extensive, causing damage to agricultural and residential areas and utilities. Building codes and subdivision regulations of Hemet and Riverside County are the only controls on flood plain development. Urbanization is expected to increase. The Salt Creek Channel was designed to provide flood protection to Sun City from the 100-year flood. Hemet Channel conveys runoff to areas south of the city. Some manmade embankments affect flooding by raising roadways above the valley floor. Maximum floods of record were January, 1952 and February, 1969; the latter had a peak discharge of 2,010 cfs. An Intermediate Regional Flood (IRF) would have a peak discharge of 13,100 cfs and the Standard Project Flood (SPF) discharge would be 25,000 cfs at the Railroad Canyon Reservoir. Both floods would overtop the major highways and inundate all secondary roads in the flood plain, damaging croplands, agricultural and residential structures. General winter storms between December and April lasting several days and local thunderstorms of high intensity and short duration cause most floods. An IRF would flow at depths of 1 to 4 ft on the flood plain with an SPF ranging 1/2 ft to 2 ft higher. Severe erosion would be created by the high velocities of flow. Both floods would peak about 12 hours from the beginning of intense rainfall. In the planning of flood control facilities, consideration should be given to the whole Salt Creek Basin, otherwise the correction of a problem at one location may create a new problem at another location. (Park-North Carolina)
W75-08177

FLOOD PLAIN INFORMATION: WILSON AND WILDWOOD CREEKS, SAN BERNADINO COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
Prepared for San Bernadino County Flood Control District, June, 1972, 33 p, 30 fig, 4 tab, 23 plates.

Descriptors: *Floods, *Flood plains, *Flooding, Flow, *Obstructions to flow, Flood water, Flood data, Flood frequency, *California.
Identifiers: San Bernadino County(Cal), *Wilson Creek(Cal), *Wildwood Creek(Cal), Yucaipo(Cal), Intermediate Regional Flood, Standard Project Flood.

January and February, 1969, were the most devastating floods of record causing $5,567,000 damage along Wilson, Wildwood, and the smaller Oak Glen Creek and Gateway Wash in the study area and adjacent land. Damage resulted from overbank flooding and high velocities causing severe erosion and bringing substantial debris downstream. This debris increased floods by jamming against bridges and other obstructions and damaged residential, commercial, and agricultural structures by depositing debris varying from 2 to 6 ft. deep over about 400 acres. Located about 15 miles southeast of the City of San Bernadino, the watershed varies in width 1 to 6 miles, is about 15 miles long. Average precipitation over the basin averages 20 inches mostly between December and March. Extreme flood peaks can rise from a nearly dry streambed in a few hours with high velocities of flow in both channel and flood plain. Lateral displacement of the streambed may occur with deposition of debris forcing cutting of a new channel, a pattern often more damaging than floodwaters. Although San Bernadino County has adopted flood plain zoning regulations, report areas have not yet been zoned except under restrictions approved by the County Planning Commission. Future floods, an Intermediate Regional Flood or a Standard Project Flood, would cause even more damage to agricultural lands and residential areas in Yucaipo, population 22,000, with problems of debris deposit, high velocity and erosion multiplied. (Park-North Carolina)
W75-08178

FLOOD PLAIN INFORMATION, ALLEGHENY RIVER, CLARION COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
Prepared for the Clarion County Planning Commission and the Commonwealth of Pennsylvania Department of Environmental Resources, June 1974, 42 p, 7 tab, 21 fig, 9 plates.

Descriptors: *Flood plains, *Flood damage, *Land use, *Flood profiles, Planning, Flood data, Snowmelt, Obstruction to flow, Ice jams, Flood control, *Pennsylvania.
Identifiers: *Allegheny River(Penn), Clarion County(Penn), Penn Central Railroad, Parker(Penn), Intermediate Regional Flood, Standard Project Flood, Flood plain management.

The flood plain of the 25.3 mile study reach of the Allegheny River through Clarion County is generally narrow and undeveloped. Damaged from past floods has not been extensive. The limited existing development is essentially residential and the main line of the Penn Central railroad which parallels the river along most of the study reach. Major floods usually occur from December through April, resulting from heavy rain and snowmelt. Although the 4 bridges in the study reach are not obstructive, the topography of the river valley causes frequent ice gorges which form temporary but effective dams, resulting in localized flood stages which can exceed those of the Intermediate Regional Flood (IRF) and Standard Project Flood (SPF). The maximum recorded flood level at Parker occurred in January, 1959, resulting from heavy rain and snowmelt and ice jamming. Despite the 5 flood control projects upstream, the peak discharge was 182,000 cfs. At Parker, peak discharge of an IRF and SPF would by 173,000 cfs and 209,000 cfs, respectively. (Diefendorf-North Carolina)
W75-08179

FLOOD PLAIN INFORMATION: BEAVERDAM CREEK, HANOVER COUNTY, VIRGINIA,
Army Engineer District, Norfolk, Va.
Prepared for Hanover County, May 1974, 28 p, 7 fig, 6 tab, 10 plates.

Descriptors: *Flood plains, *Flood damage, *Flood plain zoning, Planning, Flood profiles, Flood data, Obstruction to flow, Reservoir, Urbanization, Thunderstorms, Hurricanes, *Virginia.
Identifiers: *Beaverdam Creek(Va), Hanover County(Virginia), Totopotomoy Creek(Va), Flood plain management, Intermediate Regional Flood, Standard Project Flood.

The flood plain along Beaverdam Creek in Hanover County, five miles northeast of Richmond, Virginia, is largely undeveloped woodlands. However, Hanover County is becoming increasingly urbanized and is experiencing industrial and residential growth. Beaverdam Creek has a drainage area of 12.8 square miles. Within the 6.0 mile study reach, the stream falls an average of 12.5 feet per mile. Flooding may be caused by heavy general rains at any time, or because of the relatively small drainage area involved, flooding may occur as a result of intense rainfall during local summer thunderstorms or hurricanes. Stream heights can rise to extreme flood peaks in a relatively short time. Records of a gaging station on Totopotomoy Creek, which is located 3 miles north of Beaverdam and has similar physiographic characteristics, are indicative of flood occurrences on Beaverdam. The largest flood occurred in August, 1955. At the mouth of Beaverdam Creek, an Intermediate Regional Flood would have a peak discharge of 6,330 cfs; Standard Project Flood peak discharge would be 11,420 cfs. These floods would cause considerable damage. Five bridges cross the stream and could create obstructions to flow. The reservoir formed by an earthfill dam upstream will not significantly alter downstream flow characteristics during a large flood. (Diefendorf-North Carolina)
W75-08180

FLOOD PLAIN INFORMATION: RAPID CREEK, RAPID CITY, SOUTH DAKOTA,
Army Engineer District, Omaha, Nebr.
Prepared for City of Rapid City, June, 1973. 48 p, 24 fig, 16 plates, 6 tab.

Descriptors: Floods, *Flood damage, *Flooding, *Flood plains, Flood water, *Maximum probable flood, *Flood frequency, *Flood profiles, Obstructions to flow, Flow, Flood data, Flood protection, Flood forecasting, *South Dakota.
Identifiers: *Rapid Creek(SD), Rapid City(SD), Pennington County(SD), *June, 1972 flood, Intermediate Regional Flood, Standard Project Flood.

Rapid Creek, a Cheyenne River tributary, runs through Rapid City, second largest city in South Dakota (1970 population of 43,836). Eighteen percent of the 17 sq mi of Rapid City is in the flood plain which ranges from 2,200 to 2,900 ft wide in the business area. In the study reach, Rapid Creek channel averages 100 ft wide and 5 ft deep with an average slope of 16.5 ft/mi. Flash floods occur most frequently in May or June. Normal annual precipitation at Rapid City is 16.4 in. Pactola Dam, 14 miles upstream from Rapid City, is a multi-purpose project for irrigation, water supply and flood control with 43,00 acre-feet of storage for flood runoff. Deerfield Dam upstream from Pactola provides only incidental flood storage. Past floods were minor with one exception--the June, 1972 flood with a peak discharge of 50,000 cubic feet/second (cfs) at the Rapid City gage caused 237 deaths and $164 million damages. Pactola Dam had not the slightest effect on the outcome of the disastrous 1972 flood. Nearly every bridge between the dam and Rapid City was damaged or destroyed, due to high floodwaters, carried debris and high velocities. An Intermediate Regional Flood (IRF) would have a discharge of 14,500 cfs and the Standard Project Flood would peak at 47,000 cfs at Oshkosh Street in Rapid City. A large portion of the IRF flood plain is being cleared by the Urban Renewal Program removing highly damageable property and providing a cleared path for potential flood water to pass with less damage to remaining property. Future floods could inundate an area 2,200 - 3,000 ft wide through the city. (Park-North Carolina)
W75-08183

FLOOD PLAIN INFORMATION: VIRGIN RIVER AND FORT PIERCE WASH, VICINITY OF ST. GEORGE, WASHINGTON COUNTY, UTAH,
Army Engineer District, Los Angeles, Calif.
Prepared for Washington County Commission, April, 1973. 31 p, 22 fig, 19 plates, 6 tab.

Descriptors: Floods, *Flooding, *Flood damage, *Flood plains, *Maximum probable flood, Flood frequency, Historic floods, Flood data, Flood forecasting, Flood profile, *Utah.
Identifiers: *Virgin River(Utah), Bloomington(Utah), *Fort Pierce Wash(Utah), St. George(Utah), Washington County(Utah),

Washington(Utah), Intermediate Regional Flood, Standard Project Flood.

The Virgin River flowing southwesterly from its headwaters in Kane County, Utah, empties into Lake Mead, Arizona, draining a 6,000 sq mi area ranging in elevation from about 10,000 ft to about 1,300 ft above mean sea level. In the study reach, smooth and uniform valley lands are separated by ridges; the river gradient averages about 13 ft/mi. Fort Pierce Wash, a major tributary, flows northward from the Grand Canyon draining 1,600 sq mi between 8,000 ft to about 2,500 ft above mean sea level. Stream gradient averages 20 ft/mi through hilly areas with rock outcrops. Annual precipitation averages about 13 inches over the watershed. No major flood control projects exist or are under construction. Flash flooding with high sediment loads and severe erosion is typical. Flood plain development is minimal, most land being used for agriculture and open space. Increases in population and tourism will create pressure for development in the flood plain. Properties along the stream were severely damaged by floods of 1955, 1966, 1971. On the Virgin River, the major flood of December 1966 with a peak flow of 22,800 cubic feet per second (cfs) near Virgin, Utah caused severe erosion and destruction of bridges and roads. The greatest flood for Fort Pierce Wash was in August 1971 with an estimated flow of 15,000 cfs flooding at least 4 ft above the flood plain. Future floods predicted are the Intermediate Regional Flood (IRF) with a peak of 46,000 cfs for the Virgin River at Bloomington, a small settlement, and 104,000 cfs for a Standard Project Flood (SPF). For Fort Pierce Wash at the Virgin River, flows will reach 24,000 cfs for the IRF and 75,000 cfs for the SPF. Both floods will cause extensive damage. (Park-North Caolina)
W75-08184

COST SHARING AS AN INCENTIVE TO ATTAIN THE OBJECTIVE OF SHORELINE PROTECTION,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 6C.
W75-08185

COLLECTION OF BASIC DATA ON REPRESENTATIVE AND EXPERIMENTAL BASINS (IN FRENCH),
For primary bibliographic entry see Field 7C.
W75-08198

MONETARY VALUES OF LIFE AND HEALTH,
Tennessee Valley Authority, Knoxville. Flood Control Branch.
B. Buehler.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY1, Proceedings paper No. 11047, p 29-47, January 1975. 4 fig, 7 tab, 8 ref.

Descriptors: *Economics, *Flood control, Hydraulics, *Spillways, *Public health, *Safety, *Value engineering, Human population, Investment, Estimating, Computers, Methodology, Risks, Resources.
Identifiers: *Lost earnings technique, Life expectancy.

A Task Committee of the American Society of Civil Engineers was charged with preparing standards to evaluate the adequacy of spillways of existing dams. The committee recommends standards which require appraising the consequences of dam failures. A realistic value is needed for potential death and injury; human values are needed to measure risks. Human values are needed to achieve balance in the use of the nation's resources, all of which are spent in one form or another for the welfare of its people. The use of life earnings to measure human values is demonstrated by application to a resort area which is endangered by floods and for which flood control measures are being considered. Sensible values for life and health are proposed as a substitute for the current practice of using virtually infinite value in some engineering decisions, e.g., flood control evaluation recommended human values are based on the lifestream of earnings that would be foregone in the event of death or disability. A computing procedure is illustrated, and results are compared with other sources. The technique is considered adequate for immediate use until something better is devised. (Bell-Cornell)
W75-08202

THE AMERICAN INDIAN AND MISSOURI RIVER WATER DEVELOPMENTS,
Nevada Univ., Reno. Renewable Resources Center.
For primary bibliographic entry see Field 6B.
W75-08204

USER--ORIENTED RESEARCH DESIGNS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6A.
W75-08206

WATERSHED MANAGEMENT WITHOUT SURFACE RUNOFF,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W75-08207

THE IMPORTANCE OF PERCEPTIONS IN THE DETERMINATION OF INDIAN WATER RIGHTS,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W75-08212

LAND-BASED MODELING SYSTEM FOR WATER QUALITY MANAGEMENT STUDIES,
Gates (W. E.) and Associates, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W75-08218

INTERACTIVE SIMULATION FOR WATER SYSTEM DYNAMICS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
N. S. Grigg, and M. C. Bryson.
Journal of the Urban Planning and Development Division, American Society of Civil Engineers, Vol 101, No UP1, Proceedings paper No. 11313, p 77-92, May 1975. 6 fig, 2 tab, 2 append, 10 ref.

Descriptors: *Simulation analysis, *Water supply, *Planning, *Forecasting, Rates, Costs, Financing, Computers, Methodology, Engineering, Economics, Equations, Human population, Industries, Mathematical models, Systems analysis, Evaluation, *Colorado.
Identifiers: *Urban water systems, Environmental impact statements, *Interactive system dynamics, Fort Collins(Colo), Feedback loops, Data input, Urban engineering.

The method of simulation known as system dynamics is applied to an urban water supply problem. The technique, demonstrated by Forrester of MIT, has attracted wide interest among social scientists and the management science community. In the urban water field, the method is particularly applicable to problems concerned with the economics of supply-storage-use. Presented is an example of a rate policy simulation study for Fort Collins, Colorado. The Fort Collins model considers population, water, land, and the municipal budget as subsystems of the city. It is an economic simulation model and measures the flows of water, stocks, money, and physical plant. Input data for the water model are given. The model considers interactions among level variables and incorporates a mixture of explicit (programmed) and implicit (operator-determined) feedback loops. The use of system dynamics in conjunction with an interactive computing setup permits the use of a flexible, easily programmed, and inexpensive simulation methodology (the need for valid data, however, is not ignored). The interactive simulation is written in BASIC language and run on an office size minicomputer. The simulation can be used to evaluate the effects of a single decision or event or to observe the continuing impact of an ongoing policy. (Bell-Cornell)
W75-08219

A TECHNIQUE TO EVALUATE SNOWPACK PROFILES IN AND ADJACENT TO FOREST OPENINGS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-08221

DEVELOPMENT OF FOREST MANAGEMENT GUIDELINES FOR INCREASING SNOWPACK WATER YIELDS IN ARIZONA,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2C.
W75-08222

CHARACTERIZATION OF OPTIMAL OPERATING POLICIES FOR FINITE DAMS,
California Univ., Los Angeles. Dept. of Systems Engineering.
S. Arunkumar.
Journal of Mathematical Analysis and Applications, Vol 49, No 2, February 1975. (California Water Resources Center Project UCAL-WRC-W-341). OWRT A-043-CAL(2).

Descriptors: *Computer programs, *Dynamic programming, Multiple purpose reservoirs, Model studies, Dams, *Operations, *Optimization, Water utilization, *Regulation.
Identifiers: *Finite dams.

The economical use of reservoir water for the generation of electric power as well as for irrigational and recreational uses is an important consideration at all hydro-electric installations. Characterization of optimal regulation policies is very important, whenever possible, due to the high dimensionality of the problem. Using a dynamic programming model, Gessford and Karlin (1958) were among the first to obtain the form of optimal release rules for an infinite dam, over finite periods of time, allowing the probability distributions of the input variables and the convex cost function to depend on time. Bather (1962) has investigated the asymptotic policies for a finitc dam under the assumptions of time-homogeneous concave utility function and input probability distributions when the inflow at the start of a given period can be used in the same period. More recently, Gablinger (1971) has obtained the form of the optimal release rules in terms of certain critical numbers under piece-wise linear cost function. He suggests the use of simulation techniques for the determination of these critical numbers. Using the method of successive approximations, it is possible to characterize the critical numbers and return functions, associated with finite and infinite time horizons. This analytical characterization very naturally yields stopping rules for infinite time horizon and leads to substantial savings in computation time needed to solve large problems. (Snyder-California-Davis)
W75-08223

TEMPERATURE EFFECTS ON GREAT LAKES WATER BALANCE STUDIES,
Illinois Univ., Urbana. Water Resources Center.
For primary bibliographic entry see Field 2H.
W75-08225

CHANGE OF FEEDING OF THE GROUSE UNDER THE EFFECT OF DRAINAGE RECLAMATION, (IN RUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
For primary bibliographic entry see Field 2I.
W75-08269

THE FOREST IN THE PROTECTION OF NATURE AND THE LANDSCAPE, (IN RUMANIAN),
Academia R. S. R., Cluj. Centrul de Cercetari Biologice.
E. Pop.
Ocrotirea Nat, Vol 17, No 1, p 9-16, 1973, Illus.

Descriptors: *Natural resources, *Protection, *Forests, Ecosystems, *Forest management, Europe, Conservation.
Identifiers: Pteridium-aquilinum, *Romania, Retezat Park.

The function of the forest in enriching the air in O2 is emphasized. The loss of the forest, especially in temperate and subtropical zones, has produced deserts, soil erosion of mountainous slopes, chaotic water drainage, damages to agriculture by floods and climatic changes. The destroyed forest is replaced by low bushes and Pteridium aquilinum. Modern forestry management with replanting has partly undone the damage but has created disturbances in the equilibrium of the forest life and the ecological system by destroying the manifold variety of the primitive forest to replace it with single species. The present forest regions in all parts of the world must be conserved. In Romania, there are 17 reserves of which the Retezat national park is the most important. Pictures of some of these parks are shown. The biological equilibrium on conservation areas must be investigated to clarify the ecological system. The destroyed areas must also be reclaimed. The enlargement of the forest region is necessary to satisfy the increasing O2 demand and the disequilibrium between O2 and CO2. The world population consumes 900 billion l of O2 daily which will double in a short time.--Copyright 1974, Biological Abstracts, Inc.
W75-08272

PREDICATION OF THE BALANCE OF MATTER IN STORAGE RESERVOIRS BY MEANS OF CONTINUOUS OR SEMICONTINUOUS BIOLOGICAL MODELS: II. RELIABILITY OF THE PREDICTION METHOD, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
For primary bibliographic entry see Field 5G.
W75-08273

THE ROLE OF TRACE ELEMENTS IN MANAGEMENT OF NUISANCE GROWTHS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W75-08278

SUBDIVISION ON MALLEE FARMS,
A. K. McCord, and J. S. Potter.
Journal of Agriculture, South Australia, Vol 75, No 5, p 128-135, August, 1972. 15 fig, 1 tab.

Descriptors: *Australia, *Erosion control, *Farm management, *Range management, *Soil conservation, *Water supply, *Pasture management, Land use, Carrying capacity, Cattle, Farm equipment, Grazing, Livestock, Planning, Rotations, Sheep, Stock water, Winds.
Identifiers: Fencing, Murray Mallee area(South Australia), Crop rotation.

In the Murray Mallee area of southeastern South Australia where light rainfall and various soil types present special hazards, successful management of farm property requires careful planning. Paddock size should be determined by farm property size and by the type and number of stock carried. Cattle tend to disperse, grazing areas evenly, while sheep graze favored areas bare, thus increasing erosion risk, especially in sandy soils. Such problems can be minimized by correct subdivision with appropriate fencing and by using a rotational grazing system, which in turn will aid in cropping (crop placement and rotation), cultivation, and weed control. Farm property, to achieve its livestock potential, also must have an adequate and continuous supply of drinking water within easy access of feed and so sited as to lessen the risk of uneven grazing, particularly from sheep which graze into the wind. A survey in 1970-71 of 40 farms in the Murray Mallee indicated many benefits resulted through the use of adequate subdivision, improved fencing, and careful placement of watering facilities: greater livestock carrying capacity, greater ease of erosion control, and overall ease in management were afforded. Principles applied in this region may be used with success on farm properties elsewhere. (Gloyd-Arizona)
W75-08281

PROCEEDINGS: RESEARCH PLANNING CONFERENCE ON INTEGRATED SYSTEMS OF AQUATIC PLANT CONTROL 29-30 OCTOBER 1973.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Available from National Technical Information Service, Springfield, Va 22161. APCP (Aquatic Plant Control Program) Report, August 1974. 174 p, 44 fig, 20 tab, 6 append.

Descriptors: *Aquatic weed control, *Herbicides, *Aquatic plants, *Biocontrol, Reviews, Project, Water pollution control, Pollution abatement.

At the request of the Planning Division, Directorate Civil Works, Office, Chief of Engineers, a conference on integrated systems of aquatic plant control was held at the U.S. Army Engineer Waterways Experiment Station to review current operation activities and new research proposals, and to afford an opportunity for presentation of current research projects. (WES)
W75-08289

BIOLOGICAL CONTROL OF WATER HYACINTH WITH INSECT ENEMIES.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
Available from the National Technical Information Service, Springfield, Va 22161 as AD-775 408, $6.25 in paper copy, $2.25 in microfiche. APCP (Aquatic Plant Control Program) Technical Report 6, January 1974. 152 p, 3 fig, 3 tab, 6 append, 125 ref.

Descriptors: *Aquatic weed control, *Biocontrol, *Insects, *Water hyacinth, *Southeast U.S., Nuisance algae, Water pollution control.
Identifiers: Neochetina eichhorniae.

Present water hyacinth control programs provide at best only short-term control, and thus are of short-term benefit as far as productivity of the environment is concerned, whereas successful biological control will provide long-term benefits to productivity, with a condomitant reduction in the use of chemical or mechanical disturbances of the environment. Once a biological control agent is established, it becomes an integral part of the environment and as such may properly be considered a self-renewable resource, and a beneficial addition to our environment. It is hoped that Neochetina eichhorniae will prove to be just that, and that it will, alone or in conjunction with other native or introduced natural enemies, bring about the alleviation of the problems caused by water hyacinth in the southeastern United States. (WES)
W75-08290

NATIONAL PARKS AND NATIONAL RESERVATIONS IN THE LIGHT OF PRESENT IDEAS, (IN ROMANIAN),
Comisia Monumentelor Nationle, Bucharest (Rumania).
Val Puscariu.
Ocrotirea Nat, Vol 17, No 1, p 21-36, 1973. Illus.

Descriptors: *Parks, *National parks, Recreation facilities, Conservation, United States, Europe,
Identifiers: Czechoslovakia, France, Italy, Nymphaea-lotus-thermalis, *Romania.

The history of national parks, starting with Yellowstone Park formed in 1872 and the forest of Fontainebleau (France) in 1853 to Gran Paradiso In Italy, Retezat in Romania and Tatra in Czechoslovakia, is outlined with illustrations for scenes in these parks. There were 1204 national parks listed by the International Union for the Protection of Nature and its Resources. The parks in Romania include Retezat, Delta Dunarii, Bucegi, Ceahlau, Pietrosul Mare and others and their total area is about 100,000 ha. A scientific study of the flora and vegetation of the mountains of Retezat will be published. Detrimental human activity in these parks is also described. An alpine museum will be set up at la Sinaia in the Prahova district. Work is underway to conserve the remains of the Nymphaea lotus thermalis of the tertiary in the district of Bihor. Plans of a national conference for new national parks and reservations are described involving the creation of a park in the Apuseni Mountains in the districts of Bihor, Cluj and Alba, Romania; reservations at Piatra Craiuliu, Cheile Nerei, Muntele Cozia, Caliman and Ceahlau; a natural park connected with the hydroelectric and navigational project of Portile de Fier, Romania.--Copyright 1974, Biological Abstracts, Inc.
W75-08300

ANALYSES OF A FOREST DRAINAGE EXPERIMENT IN NORTHERN ONTARIO. I: GROWTH ANALYSIS,
Great Lakes Forestry Research Center, Sault Sainte Marie (Ontario).
B. Payandeh.
Can J For Res, Vol 3, No 3, p 387-398, 1973, Illus.

Descriptors: *Forests, Drainage, *Plant growth, *Drainage effects, *Trees, Numerical analysis, *Canada, Growth stages.

Growth analysis of the experiment carried out over 40 yr in northern Ontario (Canada) is based on remeasurement data obtained in 1969 from 38 growth plots established following drainage in 1929 and from increment cores and sectioned trees. Both annual tree diameter and height growth increased significantly after draining. Tree growth before draining was related to site quality only, while after draining it was related also to tree vigor and distance of water flow from the nearest ditch. Both stand diameter and height growth were related to site index, stand age, and initial stocking: stand basal area and volume growth were, in addition, related to a product sine function of distance of water flow from the ditch, peat moisture, decomposition and depth. Both individual tree and stand growth responded well to draining, with younger and more vigorous trees that were growing on better-quality sites showing the greatest response. For a given site, growth response was not greatest for trees and stands nearest the ditch, but for those some distance away.--Copyright 1974, Biological Abstracts, Inc.
W75-08337

4B. Groundwater Management

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1974, A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N Mex.
R. R. Cruz.
Open-file report, March 1975. 38 p, 9 fig, 5 tab, 2 ref.

Descriptors: *Water levels, *Groundwater, *Basic data collections, *New Mexico, Hydrologic data, Water wells, Water table, Water supply.
Identifiers: *White Sands Millile Range(NM).

Water-resources data collected at White Sands Missile Range, New Mexico during 1974 are presented. Data on groundwater pumpage and resulting water-level fluctuation, chemical quality, precipitation, and surface-water runoff are summarized. The present program includes periodic measurements in 14 supply wells, 25 test and observation wells, and 24 boreholes; semiannual water sampling in 8 test wells, and operation and monitoring of 5 recording rain gages in widely scattered areas on the missile range. Total groundwater pumpage in 1974 was 768,575,400 gallons. Water-level declines occurred in four of the nine supply wells in the Post Headquarters well field during the period of December 1973 to December 1974. The declines ranged from 1.38 feet to 22.00 feet. Water levels in 5 supply wells were higher in December 1974 than in December 1973. (Knapp-USGS)
W75-07857

GROUND-WATER RESOURCES OF THE WESTERN OSWEGO RIVER BASIN, NEW YORK,
Geological Survey, Albany, N.Y.
For primary bibliographic entry see Field 2F.
W75-07864

FLORIDA'S WATER RESOURCES,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-07872

ENVIRONMENTAL TRITIUM IN THE EDWARDS AQUIFER, CENTRAL TEXAS, 1963-71,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07885

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF NORTHEASTERN WYOMING, 1974-75.
Geological Survey, Cheyenne, Wyo.
For primary bibliographic entry see Field 7C.
W75-07887

THE RELEVANCE OF AQUIFER-FLOW MECHANISMS TO EXPLORATION AND DEVELOPMENT OF GROUNDWATER RESOURCES,
Department of Aquifer-Flow Mechanisms to Exploration and Development of Groundwater Resources,
M. J. Reeves, A. C. Skinner, and W. B. Wilkinson.
Journal of Hydrology, Vol 25, No 1/2, p 1-21, April 1975. 6 fig, 1 tab, 31 ref.

Descriptors: *Exploration, *Groundwater movement, *Aquifer testing, *Groundwater resources, Recharge, Surface-groundwater relationships, Water wells, Test wells, Observation wells, Pumping, Cores, Borehole geophysics, Logging(Recording), Permeability, Specific yield, Porosity, Laboratory tests, On-site tests, Sandstones, Aquifer characteristics, Anisotropy, Fractures(Geologic), Sieve analysis.
Identifiers: *England, *Wales, *Permo-Triassic aquifer, Bunter sandstone.

Detailed field and laboratory investigations on four regions of the Permo-Triassic sandstones in England and Wales showed that fissure flow is of major importance in governing the yields from abstraction wells in this aquifer. The Permo-Triassic sandstones are currently the second most important source of groundwater in the United Kingdom and their extensive development is planned for the future. An understanding of the flow mechanism has enabled suggestions to be made which would act as guidelines for exploration. It was considered that the exploration and development proposals are applicable to other fissured sandstone aquifers. (Visocky-ISWS)
W75-07896

DIGITAL SIMULATION MODEL OF AQUIFER RESPONSE TO STREAM STAGE FLUCTUATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W75-07897

CONTRIBUTIONS TO THE STUDY OF THE ALGAL FLORA OF ALGERIA. III. HYDROBIOLOGY OF CHOTT EL HODNA: AUTOECOLOGY OF THE DIATOMS,
Algiers Univ. (Algeria). Laboratoire de Botanique.
For primary bibliographic entry see Field 5C.
W75-07936

PERCHED WATER TABLE FLUCTUATION COMPARED TO STREAMFLOW,
Delaware Valley Coll. of Science and Agriculture, Doylestown, Pa.
For primary bibliographic entry see Field 2A.
W75-07946

GROUND-WATER POLLUTION BY WOOD WASTE DISPOSAL,
Oregon State Engineer's Office, Salem.
For primary bibliographic entry see Field 5B.
W75-07951

PROCEEDINGS OF THE SEMINAR ON ADVANCED WASTEWATER TREATMENT AND DISPOSAL,
Nassau-Suffolk Regional Planning Board, N. Y. Regional Marine Resources Council
For primary bibliographic entry see Field 5D.
W75-07954

THE LONG ISLAND WATER SITUATION,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 5B.
W75-07955

THE STATUS OF WASTEWATER TREATMENT ON LONG ISLAND,
Suffolk County Dept. of Environmental Control, N.Y.
For primary bibliographic entry see Field 5D.
W75-07957

WASTEWATER USE AND GROUNDWATER RECHARGE IN LOS ANGELES COUNTY,
Los Angeles County Flood Control District, Calif.
For primary bibliographic entry see Field 5D.
W75-07958

SPRINKLER IRRIGATION FOR LIQUID WASTE DISPOSAL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W75-07959

MUSKEGON, MICHIGAN,
Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 5D.
W75-07960

SANTIAGO-NORTE DRAINAGE PROJECT (CHILE),
For primary bibliographic entry see Field 3C.
W75-08109

WATERLOGGING AND SALINITY PROBLEMS IN THE INDUS PLAIN (PAKISTAN),
For primary bibliographic entry see Field 3C.
W75-08117

DENITRIFICATION IN LABORATORY SANDY COLUMNS,
Soil Conservation Service, Effingham, Ill.
For primary bibliographic entry see Field 5B.
W75-08189

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS, I. CONCENTRATION-TIME RELATIONSHIPS,
Water Planning for Israel Ltd., Tel-Aviv.
For primary bibliographic entry see Field 2K.
W75-08190

4C. Effects On Water Of Man's Non-Water Activities

NATURAL AND MODIFIED PLANT COMMUNITIES AS RELATED TO RUNOFF AND SEDIMENT YIELDS,
Geological Survey, Denver, Colo.
F. A. Branson.
In: An Introduction to Land-Water Interactions; International Association for Ecology Leningrad Symposium, August 1971: Springer-Verlag New York Inc, p 157-172, 1975. 13 fig, 32 ref.

Descriptors: *Water yield improvement, *Sediment yield, Clear-cutting, Watershed management, Vegetation effects, Soil treatment, Soil sealants, Brush control, Range management.

Better use of water resources, both at the point of origin and downstream, may be attempted by vegetation modifications and soil treatments. Vegetation conversions include pollution problems. In Arizona, fires have resulted in spectacular increases in sediment yields. Most conversion treatments that require exposure of much bare soil during the period of treatment result in increased erosion until vegetation becomes reestablished. Combined deforestation and use of herbicides to prevent regrowth in New Hampshire caused marked changes in chemical quality of the water but little change in sediment yield. In the Pacific Northwest neither clearcutting nor patchcutting caused nitrate levels to exceed federal water standards. Mechanical land treatments such as contour furrowing, ripping, and pitting perform several hydrologic functions, such as (1) reduction of flood peaks, (2) reduction of sediment yields, and (3) enhancement of onsite water use for forage production. Because runoff is low and much water is evaporated or returned to groundwater aquifers before reaching downstream users, the most efficient use of the water resource can be made by retention of water for increased forage production on lands that are suitable for mechanical treatments. A number of chemicals that decrease infiltration and increase water yields have been used experimentally. Runoff from sandy loams and loamy sands can be substantially increased and erosion reduced by the use of chemicals that cause the soil surface to become hydrophobic. (Knapp-USGS)
W75-07866

REMOTE SENSING TECHNIQUES FOR EVALUATION OF URBAN EROSION AND SEDIMENTATION,
Geological Survey, Reston, Va.
H. P. Guy.
In: Effects of Man on the Interface of the Hydrological Cycle with the Physical Environment; Proceedings of Paris Symposium, September 1974: International Association of Hydrological Sciences Publication No 113, p 145-149, 1974. 2 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Erosion, *Sedimentation, *Urban hydrology, Storm runoff, Aerial photography, Land use, Construction, Hurricanes, Sediment yield.
Identifiers: *Reston(Va).

Low-altitude aerial photography was used to supplement ground-based measurements for the evaluation of erosion and sedimentation conditions during the construction of a large office complex at Reston, Virgina. Ground measurements included precipitation, runoff, and sediment, as well as selected measurement of sheet erosion, rill development and sediment deposition. Ground-level photographs provided additional documentation of changing basin conditions. Satellite imagery could not be used because of detail loss upon the required enlargement. Low-altitude photography (scale 1:3600) gave good delineation of land-use changes. If used within a few hours of a rainstorm, low-altitude photography provided information on erosion and sedimentation features resulting from the storm. Ground-based measurements were necessary to define the timing and magnitude of the erosion and deposition processes. Sediment yield was 91 tonnes per ha during the 2-year construction period beginning September 1971. The 5.5-ha forested part of the drainage area yielded little or no sediment relative to the 14.4-ha construction area. The maximum daily sediment yield of 1.19 tonnes per hr per ha occurred during tropical storm Agnes on 21 June 1972. (Knapp-USGS)
W75-07880

CHANNEL CHANGES,
Geological Survey, Boise, Idaho.
W. W. Emmett.
Geology, Vol 2, No 6, p 271-272, June 1974. 1 fig, 3 tab, 4 ref.

Descriptors: *Channel morphology, *Aggradation, *Urbanization, *Urban hydrology, Land use, Geomorphology, Alluvial channels.

Environmental impacts may alter the quantities of water and sediment carried in a stream and thus may increase or diminish naturally occurring rates of channel changes and the pre-impact frequency of flows. Repetitive cross-channel surveys to determine changes in channel size or location measure the response of stream to environmental impact and may provide data necessary before corrective measures can be taken to minimize the effects of the impact. One effect on stream channels from the impact of urbanization can be shown, by example from one stream, to be a loss in channel size due to deposition of sediment. After 17 years of urbanization encroching on the area, the channel was only 66 percent of the size it was at the beginning of that period. (Knapp-USGS)
W75-07884

PROCEEDINGS OF THE SEMINAR ON ADVANCED WASTEWATER TREATMENT AND DISPOSAL,
Nassau-Suffolk Regional Planning Board, N. Y. Regional Marine Resources Council
For primary bibliographic entry see Field 5D.
W75-07954

THE LONG ISLAND WATER SITUATION,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 5B.
W75-07955

EROSION PROCESSES IN FELLED AREAS IN THE MOUNTAIN FORESTS OF THE CARPATHIANS,
For primary bibliographic entry see Field 4D.
W75-07975

COMMENTS ON THE HISTORY OF CONTROLLED BURNING IN THE SOUTHERN UNITED STATES,
Tall Timbers Research Station, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-07977

THE ROLE OF PRESCRIBED FIRE IN WILDLIFE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
D. A. Jones.
In: 17th Annual Arizona Watershed Symposium, Proceedings, September 19, 1973, Phoenix, p 21-22.

Descriptors: *Burning, *Chaparral, *Wildlife, management, *Watershed management, *Arizona, Conifers.
Identifiers: *Prescribed fire, Controlled burning.

Prescribed and controlled burning as a tool in wildlife habitat improvment has not been widely practiced. The carefully controlled 'hot fire' is the answer to the control of chaparral, pinyon-juniper, and mixed conifer areas. Successful burning will achieve not only successful wildlife management, but watertable control and a more complete ecological balance. Adequate financing and a technique of applying prescribed fire that will provide precision control are needed. An additional problem is getting public understanding. (McLachlan-Arizona)
W75-07980

MARKLAND LOCKS AND DAM HIGHWAY BRIDGE AND APPROACHES, KENTUCKY AND INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-KY-73-2011-F, $3.75 in paper copy, $2.25 in microfiche. December 26, 1973. 32 p, 1 chart.

Descriptors: *Bridge design, *Bridge construction, Ohio River, *Pennsylvania, Bridges, Roads, Rivers, Highways, Traffic ability, Economics, Environmental effects, Water quality, Turbidity, Pollutants.
Identifiers: *Environmental impact statements, *Pittsburg(Pa).

The proposed action entails construction of a two-lane highway bridge, supported by the Markland Dam, crossing the Ohio River 531.5 river miles below Pittsburgh, Pennsylvania. The project will also include construction of short approach roads on each side of the river to connect the proposed bridge to existing highways. The chief beneficial impact of the construction will be to facilitate traffic flow in the vicinity of the bridge, which will act as a stimulus to economic growth. Adverse environmental effects include loss of land on each side of the bridge required for construction of approach roads, and more if other road construction occurs as a result of the project; an increase in the level of air and noise pollution in the area; and temporary turbidity increases during construction and rainy weather. The only alternative to the proposed action is no action. (Gagliardi-Florida)
W75-08041

INTEGRATING CHEMICAL FACTORS WITH WATER AND SEDIMENT TRANSPORT FROM A WATERSHED,
Agricultural Research Service, Chickasha, Okla.
For primary bibliographic entry see Field 5B.
W75-08099

RECREATION USES CHANGE MOGOLLON RIM ECONOMY,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station; and Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W75-08108

BRUSHY BASIN-A FORMULA FOR WATERSHED MANAGEMENT SUCCESS,
Santa Ana Watershed Planning Agency, Calif; and Santa Ana Watershed Project Authority, Riverside, Calif.
R. E. Moore, and W. A. Warskow.
In: 17th Annual Arizona Watershed Symposium, Proceedings September 19, 1973, Phoenix, p 18-20.

Descriptors: *Watershed management, *Burning, *Watersheds(Basins), *Chaparral, *Arizona, Resources development, Water yield improvement, Brush control, National forests.
Identifiers: *Controlled burning, *Brushy Basin(Ariz).

Brushy Basin's 8,000 acres of chaparral represents some of Arizona's thirstiest water-using shrubbery. A successful formula for proper management of the area employed three factors: (1) sufficient research existed about the area to support a watershed management program, (2) wildfire problems of Arizona's chaparral were well known, and (3) controlled burning and scheduled maintenance of the Brushy Basin combined to create a comprehensive plan for resource management. The institutions responsible for Arizona's natural resources provided the technical know-how to successfully implement the formula for watershed management in this particular area which could be used as a prototype for other programs under similar conditions. (McLachlan-Arizona)
W75-08196

THE CARRIZO-CIBECUE WILDFIRE IN RETROSPECT, WHAT IT DID AND WHAT WE ARE DOING ABOUT IT,
Arizona Univ., Tucson. Dept. of Watershed Management.
R. F. Wagle.
In: 17th Annual Arizona Watershed Symposium, Proceedings, September 19, 1973, Phoenix, p 23-27. 2 tab, 11 ref.

Descriptors: *Forest fires, *Burning, *Erosion, *Flooding, *Arizona, Surface runoff, Flood damage.
Identifiers: White Mountain Indian Reservation(Ariz), Cibecue Creek(Ariz), Wildfire, Controlled burning.

The 1971 Carrizo wildfire in the White Mountain Indian Reservation in Arizona burned 57,335 acres, with a loss of millions of board feet of harvestable timber, and resulted in flooding conditions in Cibecue Creek which in turn resulted in a substantial fish kill. The fire had its advantages, however, in burning dangerously overgrown areas. The disaster has brought out all aspects of the burning question. The creation of a Wildland Fire Ecology Research Center is proposed to study controlled burning as a way of alleviating the disastrous effects of wildfire in Arizona. (McLachlan-Arizona)
W75-08197

NATIONAL PARKS AND NATIONAL RESERVATIONS IN THE LIGHT OF PRESENT IDEAS, (IN ROMANIAN),
Comisia Monumentelor Nationle, Bucharest (Rumania).
For primary bibliographic entry see Field 4A.
W75-08300

URBANIZATION AND THE MICROBIAL CONTENT OF THE NORTH SASKATCHEWAN RIVER,
Alberta Univ., Edmonton. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W75-08329

4D. Watershed Protection

RECONNAISSANCE OF SEDIMENTATION IN THE UPPER RIO BERMEJO BASIN, ARGENTINA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2J.
W75-07859

HYDROLOGIC DATA NEEDS FOR SMALL WATERSHEDS--STREAMFLOW AND RELATED PRECIPITATION DATA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-07874

SIMULATION OF SOIL EROSION--PART I. DEVELOPMENT OF A MATHEMATICAL EROSION MODEL,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 2J.
W75-07926

SIMULATION OF SOIL EROSION--PART II. STREAMFLOW AND SUSPENDED SEDIMENT SIMULATION RESULTS,
International Rice Research Inst., Los Banos, Laguna (Philippines).
For primary bibliographic entry see Field 2J.
W75-07927

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
For primary bibliographic entry see Field 5G.
W75-07931

NONERODIBLE AGGREGATES AND CONCENTRATION OF FATS, WAXES, AND OILS IN SOILS AS RELATED TO WHEAT STRAW MULCH,
Agricultural Research Service, Akron, Colo. Central Great Plains Field Station.
D. E. Smika, and B. W. Greb.
Soil Science Society of America Proceedings, Vol 39, No 1, p 104-107, January-February 1975. 1 fig, 4 tab, 12 ref.

Descriptors: *Wind erosion, *Cultivation, *Soil structure, Soil stabilization, Soil erosion, Rotations, Farm management, Wheat, Fallowing, Erosion, Soil conservation.

Nonerodible (greater than 0.84 mm) soil aggregates and concentration of fats, waxes, and oils in the surface 5-cm depth were determined as related to (1) rates of initial straw mulch, (2) date of initial fallow tillage, (3) removal of straw, and (4) nitrogen fertilization. Nonerodible soil aggregates were also determined as affected by tillage implements commonly used in fallow with residue removed by burning and with residue present. Soil erosion by wind in the Central Great Plains can be reduced significantly by (1) using implements that have a minimal effect on the destruction of nonerodible aggregates, (2) maintaining as much as possible of the wheat straw mulch on the soil surface, and (3) combining 1 and 2 to maintain as high as possible the concentration of fats, waxes, and oils in the soil to act as binders for soil aggregates. Increasing the concentration of fats, waxes, and oils in the soil to increase nonerodible aggregation is of greatest importance when they increase nonerodible soil aggregation to the level necessary for wind erosion control. (Sims-ISWS)
W75-07940

AN INTERDISPLINARY APPROACH TO DEVELOPMENT OF WATERSHED SIMULATION MODELS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 2A.
W75-07947

CONCENTRATION EFFECTS OF SETTLING-TUBE ANALYSIS,
Technische Hogeschool, Delft (Netherlands). Department of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-07949

EROSION PROCESSES IN FELLED AREAS IN THE MOUNTAIN FORESTS OF THE CARPATHIANS,
V. N. D'yakov.
Soviet Hydrology, Selected Papers No 3, p 273-276, 1973, 2 tab, 5 ref. Translated from Lesovedeniye, No 3, p 55-59, 1973.

Descriptors: *Forest management, *Soil erosion, *Lumbering, Erosion control, Sediment control, Surface runoff, Forestry, Land use, Mountain forests, Forest soils, Cutting management, Watersheds(Basins).
Identifiers: *USSR(Carpathian Mountains).

The dependence of soil erosion during logging operations in the Carpathians on felling and skidding methods, the dimensions of felled areas, the seasonality of logging operations, and other factors were examined. Data were presented on surface runoff and the dynamics of water erosion. Investigations showed that the seasonality of logging operations is very important in reducing soil erosion. For example, during logging operations in a beech forest at a site extending 200 m along the slope, soil erosion amounted to 21 cu m/hectare during logging in winter and to 68 cu m/hectare in summer. The degree of damage to the soil surface and the magnitude of erosion are directly related to the size of new growth. An average of 30% of the soil surface was damaged in an area with dense new growth and 40-50% in an area with thin new growth. The same relation was observed for erosion. Providing for good new growth is apparently one of the effective methods for controlling soil erosion. The duration of erosion processes also determines the degree of damage to the soil surface. There was no water erosion at all during winter logging, with proper logging practices and skidding with a VTU-3 skidder, or it was local and ceased the second year after felling. During the first stage of gradual felling and on small felling sites where horse skidding was used, erosion ceased in the second year after cutting and on large felling sites in the fourth year. During the second stage of gradual felling and in clear-cut areas, where the logs were tractor skidded, water erosion was observed 4-5 yrs after felling and becomes particularly severe during catastrophic rains. (Humphreys-ISWS)
W75-07975

THE ROLE OF PRESCRIBED FIRE IN WILDLIFE MANAGEMENT,
Forest Service (USDA), Albuquerque, N. Mex. Rocky Mountain Forest and Range Experiment Station.
For primary bibliographic entry see Field 4C.
W75-07980

PALATLAKAHA RIVER WATERSHED, LAKE COUNTY, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Gainesville, Fla.
For primary bibliographic entry see Field 8A.
W75-08022

SPRING BROOK WATERSHED, LANGLADE AND MARATHON COUNTIES, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-08035

PROPOSED HABITAT ENHANCEMENT PROJECT TOPCOCK MARSH UNIT, HAVASU NATIONAL WILDLIFE REFUGE, ETC. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 8D.
W75-08038

BIG RUNNING WATER DITCH WATERSHED PROJECT, LAWRENCE AND RANDOLPH COUNTIES, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Little Rock, Ark.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-AR-73-1501-F, $4.75 in paper copy, $2.25 in microfiche. Spetember 14, 1973. 79 p, 1 tab.

Descriptors: *Watershed management, *Channel improvement, *Sedimentation, Channels, Floodwater, Fish, *Arkansas, Agriculture, Wildlife, Vegetation, Aesthetics, Erosion, Sediments, Environmental effects, Levees, Floodways, Floodproofing.
Identifiers: *Environmental impact statements, Lawrence County(Ark), Randolph County(Ark).

The project entails construction of a small watershed in Lawrence and Randolph Counties, Arkansas. The proposed action includes land treatment measures and channel work for floodwater damage reduction and agricultural water management, with measures designed to minimize losses to fish and wildlife habitat and improve the aesthetic values of the watershed. The land treatment measures alone will reduce erosion and sediment yield into the channel system and combined with the structural measures will reduce floodwater damage an estimated 76 percent. Agricultural efficiency and fishery habitat will be improved and wildlife management will be more flexible. Adverse environmental effects include increasing sedimentation downstream during construction; channel bank erosion; destruction of present vegetation cover on one side of the channel; traffic, noise and pollution during construction; and loss of acres of agricultural land. Alternatives considered were exclusive use land treatment measures, construction of a floodway with levees, floodproofing the most seriously damaged fields or no action. (Gagliardi-Florida)
W75-08039

DIKED DISPOSAL AREA, HURON HARBOR, ERIE COUNTY, HURON, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, NY.
For primary bibliographic entry see Field 5G.
W75-08048

PERILLA MOUNTAIN WATERSHED PROJECT, COCHISE COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-AZ-74-0020-F, $3.75 in paper copy, $2.25 in microfiche. January 3, 1974. 41 p, 4 fig, 3 tab.

Descriptors: *Watershed management, *Land management, *Retardance, *Diversions, *Arizona, Diversion structures, Vegetation, Vegetation establishment, Watersheds(Basins), Floods, Flood water, Flood protection, Flood damage, Flood control, Flood data, Sediments, Wildlife habitats, Flood plains, Flood plain zoning, Flood plain insurance, Floodproofing.
Identifiers: *Environmental impact statements, Cochise County(Ariz).

The Perilla Mountain Watershed Project consists of conservation land treatment, two floodwater retarding structures, two floodways and one diversion. It is designed for watershed protection and flood prevention in Cochise County, Arizona. The land treatment measures will increase vegetation cover and improve range conditions. The average annual reduction in floodwater and sediment damages will be about 76%. Approximately 250 acres of vegetation will be disturbed by the construction. In addition, brush control will reduce wildlife cover for some species on approximately 600 acres. Noise and dust pollution will occur during construction. Consideration was given to implementation of the various measures in different combinations, as well as to a non-structural system including zoning, floodproofing, flood insurance and land purchase. (Denvir-Florida)
W75-08051

HIGHWAY 112 CRITICAL EROSION CONTROL RESOURCES CONSERVATION AND DEVELOPMENT PROJECT MEASURE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Madison, Wis.
For primary bibliographic entry see Field 8A.
W75-08055

INDIAN CREEK WATERSHED PROJECT, CITY OF CHESAPEAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 8A.
W75-08058

EAGLE-TUMBLEWEED DRAW WATERSHED, EDDY AND CHAVES COUNTIES, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-NM-73-2017-F, $4.75 in paper copy, $2.25 in microfiche. December 26, 1973. 79 p, 1 map.

Descriptors: *Watershed management, *Land management, *Retardance, *Diversion structures, Urban renewal, Vectors(Biological), Watersheds(Basins), Flood water, Flood protection, Wildlife habitats, Forages, *New Mexico.
Identifiers: *Environmental impact statements, Eddy County(NM), Chavez County(NM).

The Eagle-Tumbleweed Draw Watershed project provides for conservation land treatment measures, a floodwater retarding structure, two diversions, and an outlet channel. Its purpose is to provide watershed protection and flood prevention for Eddy and Chavez Counties, New Mexico. It is anticipated that implementation will result in the creation of a better urban environment, accelerated urban renewal and land use planning, and a reduction in health hazards such as vector breeding and water contamination. While some wildlife habitat will be disturbed or destroyed, it is expected that forage for seed-eating animals will improve and that the reduction in erosion in the long run will result in increased quantity and quality of livestock forage and wildlife habitat. Various structural and non-structural alternatives were considered. (Denvir-Florida)
W75-08060

MISSOURI RIVER GARRISON DAM TO LAKE OAHE RESERVOIR (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 8A.
W75-08061

PAINT CREEK WATERSHED, HARPER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Stillwater, Okla.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-OK-73-1781-F, $3.75 in paper copy, $2.25 in microfiche. November 12, 1973. 41 p, 1 tab, 2 map.

Descriptors: *Watershed management, *Oklahoma, *Environmental effects, *Dam construction, *Flood protection, Federal government, Floodways, Flood control, Multiple-purpose projects, Recreation, Water resources development, Water management(Applied), Land management, Flood plains, Dams, Levees, Erosion control, Sediment control, Wildlife habitats.
Identifiers: Dam effects, *Environmental impact statements, Harper County(Okla).

The project involves improvements to be made in the Paint Creek Watershed in Harper County, Oklahoma. The project includes: land treatment measures on 3,847 acres of agricultural land, one floodwater retarding structure, 1.1 mile of waterway, and development of 30 acres of wildlife habitat. The project area consists primarily of pastureland, with some cropland and slight urbanization. By significantly reducing floodwater, sediment, and erosion damages on the 1,478 acres of agricultural and urban floodplain, the project will enhance the economic and recreational development of the region. Adverse effects will include temporary removal of vegetation on 21 acres during construction, loss of production from 51 acres of pasture to be converted to a lake area, and rapid depletion of stored water due to the high rate of evaporation from the lake's surface. Alternatives considered unfeasible were land treatment only, land treatment with one floodwater retarding structure, floodplain zoning, a floodway with dikes, and no action. The project will enhance the long-term productivity of the floodplain. All structure sites are reclaimable, needing only a few years to re-establish cover similar to present conditions. There is no significant opposition to this project. (Deckert-Florida)
W75-08062

DRIP IRRIGATION FOR REVEGETATING STEEP SLOPES IN AN ARID ENVIRONMENT,
American Smelting and Refining Co., Sahuarita, Ariz.
S. A. Bengson.
Progressive Agriculture in Arizona, Vol 27, No 1, p 3-5, 12, January-February, 1975. 8 fig, 3 ref.

Descriptors: *Arid lands, *Vegetation establishment, *Slope stabilization, *Water conservation, *Irrigation practices, *Arizona, Erosion, Runoff, Leaching, Desert plants, Salts.
Identifiers: *Drip irrigation.

Climate, alkaline-saline soils, lack of organics, and steep slopes are major obstacles in revegetating disturbed sites in arid environments, but techniques designed to achieve revegetation have been slow to be developed. Drip irrigation has been used for farming in arid regions. The primary advantage of drip, or trickle, irrigation is conservation of water, but on steep slopes it also is important because of its capacity to apply sufficient water to a plant at a slow enough rate to alleviate runoff and subsequent erosion. Drip irrigation is also capable of leaching excess salts and other phytotoxins from the root zone. Disadvantages include costs, depending on the plant density desired, possible accumulation of salts at the edge of the wetting zone, and ineffectiveness in producing a solid vegetative cover. For extremely steep slopes or other areas difficult to revegetate, drip irrigation may be the best solution for providing vegetation to stabilize disturbed sites and improve aesthetics. (Mastic-Arizona)
W75-08102

PRECIPITATION AND STREAMFLOW ON THREE SMALL CHILEAN WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 2A.
W75-08104

HYDROLOGIC SIMULATION OF WATERSHEDS WITH ARTIFICIAL DRAINAGE,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W75-08191

BRUSHY BASIN-A FORMULA FOR WATERSHED MANAGEMENT SUCCESS,
Santa Ana Watershed Planning Agency, Calif; and Santa Ana Watershed Project Authority, Riverside, Calif.
For primary bibliographic entry see Field 4C.
W75-08196

THE CARRIZO-CIBECUE WILDFIRE IN RETROSPECT, WHAT IT DID AND WHAT WE ARE DOING ABOUT IT,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 4C.
W75-08197

WATERSHED MANAGEMENT WITHOUT SURFACE RUNOFF,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
D. M. Manbeck.
Water Resources Bulletin, Vol 10, No 3, p 586-591, June 1974. 3 fig.

Descriptors: *Watershed management, *Flood control, *Agricultural engineering, *Surface runoff, *Constraints, Retention, Design, Control, *Great Plains, *Nebraska, Surface drainage, Pumping plants, Storage, Irrigation, Crops.
Identifiers: Alternatives, Water movement.

Legal, economic, and social constraints prevented the development of a surface outlet from an 878 acre watershed in the eastern Great Plains. However, frequent flooding of potentially excellent cropland within the watershed had to be controlled. The process of considering various alternatives within given constraints and utilizing natural features of the watershed to attain a water management system without surface runoff is presented. Operational and physical constraints to water management schemes for the watershed include: (1) utilization of as much of the area with uniform soils as possible for field crops production; (2) removal of excess surface water from the fields within 24 hours; (3) provision for ready access to all fields; (4) irrigation of fields by surface methods; and (5) retention of at least four inches of top soil for the soil surface. The resulting coordinated system includes surface drainage, water-holding structures, and pumping plants. The excellent water control provided permits effective

utilization of more than 115 acres of land which was previously of very low productivity. (Bell-Cornell)
W75-08207

SUBDIVISION ON MALLEE FARMS,
For primary bibliographic entry see Field 4A.
W75-08281

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A SUMMARY OF SELECTED CHEMICAL-QUALITY CONDITIONS IN 66 CALIFORNIA STREAMS, 1950-72,
Geological Survey, Menlo Park, Calif.
G. A. Irwin, and M. Lemons.
Open-file report, March 1975. 104 p, 4 fig, 1 tab, 8 ref.

Descriptors: *Water quality, *Water chemistry, *Streams, *California, Surface waters, Data collections, Hydrologic data, Regression analysis.

Water from California streams has been analyzed for concentrations of selected chemical constituents since the early 1950's. This summary includes about 1,200 water years of data from 88 sampling sites on 66 streams. About 80 percent of the sites had a mean dissolved-solids concentration of 400 milligrams per litre or less. All the sites that had mean concentrations ranging from 601 to 800 milligrams per litre were in either the South Coastal or Central Coastal subregions. Results of regression analysis between specific conductance and calcium, magnesium, sodium, bicarbonate, dissolved solids, and hardness usually indicate a high percentage of explained variance. Other constituents, such as potassium, sulfate, chloride, and particularly nitrate, were not as frequently highly associated with specific conductance. At sites where the water discharge was highly regulated, the variation in specific conductance that was explained as a function of discharge ranges from 0 to more than 90 percent, whereas at the unregulated sites, the explained variance ranges from 50 to more than 90 percent. (Knapp-USGS)
W75-07858

HYDROGEOLOGIC AND WATER-QUALITY DATA IN WESTERN JEFFERSON COUNTY, COLORADO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 2F.
W75-07862

WATER QUALITY OF HYDROLOGIC BENCH MARKS--AN INDICATOR OF WATER QUALITY IN THE NATURAL ENVIRONMENT,
Geological Survey, Reston, Va.
J. E. Biesecker, and D. K. Leifeste.
Circular 460-E, 1975. 21 p, 12 fig, 11 tab, 10 ref.

Descriptors: *Water quality, *Basic data collections, *Hydrologic data, Pesticides, Dissolved solids, Anions, Cations, Salts, Solutes, Baseline studies, Water quality standards.
Identifiers: *Hydrologic bench marks.

Water-quality data, collected at 57 hydrologic bench-mark stations in 37 States, allow the definition of water quality in the natural environment and the comparison of natural water quality with water quality of major streams draining similar water-resources regions. Water quality in the natural environment is generally very good. Streams draining hydrologic bench-mark basins generally contain low concentrations of dissolved constituents. Water collected at the hydrologic bench-mark stations was analyzed for the following minor metals: arsenic, barium, cadmium, hexavalent chromium, cobalt, copper, lead, mercury, selenium, silver, and zinc. Only three samples contained metals in excess of U.S. Public Health Service recommended drinking-water standards--two selenium concentrations and one cadmium concentration. Widespread but very low-level occurrence of pesticide residues in the natural environment was found--about 30 percent of all samples contained low-level concentrations of pesticidal compounds. The relationship between dissolved-solids concentration and discharge per unit area in the natural environment is a tool for approximating natural water quality. Average annual runoff and rock type can be used as predictive tools to determine the maximum dissolved-solids concentration expected in the natural environment. (Knapp-USGS)
W75-07888

HYDROCARBONS IN THE MARINE ENVIRONMENT, I. N-ALKANES IN THE FIRTH OF CLYDE,
Torry Research Station, Aberdeen (Scotland).
P. R. Mackie, K. J. Whittle, and R. Hardy.
Estuarine and Coastal Marine Science, Vol 2, No 4, p 359-374, October 1974. 10 fig, 5 tab, 20 ref.

Descriptors: *Organic compounds, *Marine biology, *Analytical techniques, *Aquatic life, *Organic matter, Benthos, Plankton, Organic wastes, Saline water, Water quality, Sediments, Fish, Chemical analysis, Chromatography, Solvents, Solvent extractions, Separation techniques, Distillation.
Identifiers: *Marine environment, *Alkanes, *Firth of Clyde, Surface film, Irving Bay, Pentane, Chloroform, Methanol.

Water, surface film, sediment, plankton and fish from the Firth of Clyde were examined to determine the amount of distribution of hydrocarbons. All samples contained hydrocarbons although at very low levels. The distribution of n-alkanes was of two types: first, a relatively smooth increase from C sub 18 to C sub 26 then a decrease to C sub 33 for water, plankton, and fish muscle; second, a strong odd carbon number predominance in the range C sub 25-C sub 33 for the sediment, benthos, and fish liver samples. No evidence was found for accretion of hydrocarbons at higher levels of the food chain. It was not possible to determine unequivocally whether the hydrocarbons present in the samples were biogenic or nonbiogenic. (Henley-ISWS)
W75-07894

MODE: IGPP MEASUREMENTS OF BOTTOM PRESSURE AND TEMPERATURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 7B.
W75-07904

DIFFUSION COEFFICIENTS CALCULATED FROM THE MEDITERREAN SALINITY ANOMALY IN THE NORTH ATLANTIC OCEAN,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 2L.
W75-07912

A METHOD FOR THE STEPWISE ENRICHMENT FOR THE DEMONSTRATION OF SALMONELLA IN FRESH AND SALT WATER, (IN GERMAN),
H. H. Wuthe.
Zentralbl Bakteriol Parasetenko Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 157, No 4, p 328-332, 1973, English summary.

Descriptors: *Salmonella, *Fresh water, *Saline water, Bacteria, Sampling, Water pollution sources, Pollutants, Growth stages.
Identifiers: Tetrathionate, Step-wise enrichment.

A method and the results of a stepwise enrichment of Salmonella in fresh and salt water samples over a period of 6 yr are reported. The enrichment takes place via 3 stages with increasing tetrathionate concentration. At each stage olating takes place after 24 hr incubation and a further 24 h standing at room temperature. Although the most positive findings were found in the 3rd stage of enrichment, the examination of each individual stage is necessary as 27% of the positive results were obtained exclusively with 1 plate.--Copyright 1974, Biological Abstracts, Inc.
W75-07928

COMPARISON OF GELATINE AND KIEBO PLATES FOR DETERMINING THE COLONY COUNT IN DRINKING WATER: I, (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.
G. Mueller.
Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med, Vol 157, No 4, p 376-386, 1973. (English summary).

Descriptors: *Potable water, *Water analysis, Bacteria, Water pollution sources, Pollutant identification.
Identifiers: Gelatin, Kiebo plates, Silicic-acid.

In a comparison of the colony counts obtained from about 7000 different waters (ground water, waterside filtrates, drinking water from the public supply pipes, water after phosphating and ion exchange installations, mineral waters, waters percolating through rubbish tips) using gelatin and Kiebo (= Kieselsaurenahrboden: silicic acid culture medium) pour plates by setting limiting values of less than 10/ml, over 10/ml but under 100/ml, over 100/ml but less than 1000/ml and over 10,000/ml and over 10,000/ml, 100% agreement could only be obtained for colony counts below 5/ml and over 500/ml while in the over 10 and under 100/ml range, which is relevant for the bacteriological assessment of drinking water, there was agreement in 77.8%. The greatest differences were found in phosphated waters and mineral waters (higher Kiebo Plate counts) and drainage from ion exchangers and rubbish tip waters (higher gelatin counts).--Copyright 1974, Biological Abstracts, Inc.
W75-07933

ANALYSIS OF LAS, ABS AND COMMERCIAL DETERGENTS BY TWO-PHASE TITRATION,
Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Environmental Engineering.
L. K. Wang, J. Y. Yang, R. G. Ross, and M. H. Wang.
Water Resources Bulletin, Vol 11, No 2, p 267-277, April 1975. 6 fig, 6 ref. USAMERDC Contract DAAK02-73-C-0206.

Descriptors: *Detergents, *Analytical techniques, *Surfactants, *Alkylbenzene sulfonates, *Linear alkylate sulfonates, Water analysis, Chemistry, Estimating, On-site tests, Testing, Domestic wastes, Soaps, Water quality, Waste identification, Evaluation, Reactance, *Pollutant identification, Environmental sanitation, *Volumetric analysis.
Identifiers: *Two-phase titration, Field test kit.

A two-phase titration method was developed and evaluated to determine the concentration of linear alkylate sulfonate (LAS), branched-chain alkyl benzene sulfonate (ABS), dishwashing detergents, and laundry detergents in water. This method is capable of quantitatively determining anionic sur-

factants in either fresh water or saline water and it is therefore superior to the widely used Methylene Blue Method. To simplify the titration method for adaptation to remote field utilization, a field test kit was developed. This test kit includes only a separatory funnel, a titration burette, a set of liquid measuring apparatus, and some chemicals. Emphasis was placed on compactness of the kit and simplicity in the test manipulation, so that its operation can be performed by relatively unskilled wastewater monitoring personnel. (Henley-ISWS)
W75-07937

A CONTRIBUTION TO THE ECOLOGICAL STUDY OF A MOROCCAN ATLANTIC ESTUARY: THE ESTUARY OF BOU REGREG: I,
Institut Scientifique Cherifien, Rabat (Morocco). Lab. of Zoology.
For primary bibliographic entry see Field 2L.
W75-07938

FLUORINE IN GROUND WATER AS A GUIDE TO PB-ZN-BA-F MINERALIZATION,
Toronto Univ. (Ontario). Dept. of Geology.
For primary bibliographic entry see Field 2K.
W75-07953

LOW WINTER DISSOLVED OXYGEN IN SOME ALASKAN RIVERS,
Environmental Protection Agency, Arctic Environmental Research Lab. College, Alaska.
For primary bibliographic entry see Field 5B.
W75-07966

PHOSPHORUS UPTAKE AND RELEASE BY LAKE ONTERIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program; and Wisconsin Univ., Madison. Dept. of Soils.
R. T. Bannerman, D. E. Armstrong, R. F. Harris, and G. C. Holdren.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-240 614, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-660/3-75-006, February 1975. 51 p, 4 fig, 17 tab, 33 ref. R-800609.

Descriptors: Eutrophication, *Phosphorus, *Sediments, Sediment-water interfaces, *Lake Ontario, Lakes, Great Lakes, Pollutant identification, Absorption, Water pollution sources.

Sediment cores were obtained from 15 lake stations representing the three major basins and the Inshore Zone of Lake Ontario. Cores were sectioned for characterization of the surface sediments according to inorganic P chemical mobility. Physical mobility was characterized by measurement of P release from intact cores incubated under controlled laboratory conditions. The proportions of potentially chemically mobile inorganic P were usually high (30 to 60%) in the central basin sediments and low (2 to 8%) for the inshore zone sediments. Although the amounts of inorganic P desorbed after three successive equalibrations (in .1M NaCl) of Lake Ontario sediments represented only 3 to 17% of the potentially mobile inorganic P, sufficient inorganic P was described to restore a large part of the original interstitial inorganic P concentrations. Interstitial inorganic P (mobile P) concentrations ranged from 14 to 1280 micrometers/l and were higher than dissolved inorganic P concentrations in the overlying water. Diffusion rates estimated from the range of observed interstitial inorganic P values ranged from about 0.05 to 0.6 mg m-2 day-1 and were in agreement with the range of 0.03 to 0.8 mg m-2 day-1 estimated from P release from intact cores incubated under controlled laboratory conditions. Based on an inorganic P flux of 0.2 mg m-2 day-1, the estimated annual contribution of inorganic P to Lake Ontario water is equal to about 10% of the external P loading. (EPA)
W75-07972

EFFECTS OF MIREX AND HMETHOXYCHLOR ON STRIPED MULLET, MUGIL CEPHALUS L.,
Oceanic Inst., Waimanalo, Hawaii.
For primary bibliographic entry see Field 5C.
W75-07973

LEVELS OF COPPER, NICKEL, RUBIDIUM, AND STRONTIUM IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration, Cincinnati, Ohio.
G. K. Murthy, U. S. Rhea, and J. T. Peeler.
Environmental Science and Technology, Vol 7, No 11, p 1042-1045, November, 1973. 1 fig, 4 tab, 38 ref.

Descriptors: *Copper, *Nickel, *Strontium *Diets, *Distribution, Institutions, Sampling, Analytical techniques, Spectroscopy, *Pollutant identification, Trace elements.

The average trace element content in the diets of institutionalized children, aged 9 to 12, from 28 U.S. cities, expressed as mg/kg of food, varied as: copper, 0.438-0.873; nickel, 0.140-0.321; rubidium, 0.601-2.338; and strontium, 0.319-0.957. Similarly, the consumption of food varied from 1.18-2.55 kg/day and the milk content of diet varied from 9.5-63.8%. Minerals from drinking water were not included in the study. Statistical analyses of the data (mg/day) showed significant seasonal and geographical variations. Monthly averages for all elements showed that copper was slightly higher during summer, rubidium and strontium tended to peak during spring and autumn, and no trend could be ascribed to nickel. The low and high levels of trace elements observed in different geographical areas were briefly discussed. (Jernigan-Vanderbilt)
W75-08075

CLEAN ENVIRONMENT FOR ULTRATRACE ANALYSIS,
Baker (J.T.) Chemical Co., Phillipsburg, N.J. Research Labs.
M. Zief, and A. G. Nesher.
Environmental Science and Technology, Vol 8, No 7, p 677-678, July 1974. 2 fig, 1 tab, 11 ref.

Descriptors: *Analytical techniques, *Laboratory tests, *Trace elements, *Metals, *Air pollution, Testing procedures, Human pathology, Chromium, Nickel, *Pollutant identification.
Identifiers: *Interferences.

The inability to control ambient air blanks at levels insignificant in comparison with the constituent being determined severely restricts accuracy and precision of ultratrace metal determinations. Reduction in that portion of the blank contributed by laboratory air is discussed. Techniques were presented for upgrading a laboratory to control contamination from particulates in air. The importance of humidity control in elimination of electrostatic charges was also discussed. (Jernigan-Vanderbilt)
W75-08078

TEMPERATURE CONTROLLED HEATING OF THE GRAPHITE TUBE ATOMIZER IN FLAMELESS ATOMIC ABSORPTION SPECTROMETRY,
Umea Univ. (Sweden). Dept. of Analytical Chemistry.
G. Lundgren, L. Lundmark, and G. Johansson.
Analytical Chemistry, Vol 46, No 8, p 1028-1031, July 1974. 9 fig, 1 tab, 5 ref.

Descriptors: *Analytical techniques, *Spectroscopy, *Cadmium, *Lead, Laboratory tests, Sampling, Testing procedures, *Pollutant identification.
Identifiers: *Atomic absorption spectroscopy, Atomizer.

A temperature controller for graphite rods or tubes in flameless atomic absorption was described. An infrared detector senses the radiation from the graphite and the power is regulated by a triac. The temperature of the graphite tube is raised rapidly and then kept constant with plus or minu 10 degrees. The atomization procedure can be optimized which is important when interfering substances are present. Cadmium can be determined in sodium chloride at sea water concentrations with a detection limit of 0.03 micrograms Cd/l. at an atomization temperature of 820 degrees. The determination of lead was made both with the common constant voltage heating and with the described controller and the results were compared. (Jernigan-Vanderbilt)
W75-08079

SOME ANALYTICAL APPLICATIONS OF REACTION-RATE-PROMOTING EFFECTS--THE TRIS(1,10-PHENANTHROLINE)IRON(II)-CHROMIUM(VI) INDICATOR REACTION,
Oklahoma State Univ., Stillwater. Dept. of Chemistry.
V. V. S. E. Dutt, and H. A. Mottola.
Analytical Chemistry, Vol 46, No 8, p 1090-1094, July 1974. 3 fig, 2 tab, 24 ref.

Descriptors: *Metals, *Analytical techniques, *Oxidation, *Chemical reactions, Chromium, Vanadium, Arsenic compounds, Molybdenum, Spectroscopy, Laboratory tests, Testing procedures, Instrumentation, Rates, *Pollutant identification.

Several rate-accelerating effects on the oxidation of ferroin by Cr(VI) in sulfuric acid medium were reported. In all cases, these effects were observed in the earlier portions of the reaction profile and no catalytic cycle appeared to be associated with them. Conversion of the rate-modifying species to an inactive form by destruction or, mainly, by complexation with Cr(III) seemed to account for the lack of catalytic cycle. Judicious choice of reaction conditions allowed the determination (by initial rate measurements) of microgram amounts/milliliter or oxalic acid, citric acid, vanadium(IV), arsenic(III), chromium(VI), hexacyanoferrate(III), and mg/ml of molybdenum(VI). (Jernigan-Vanderbilt)
W75-08080

INTERNAL NORMALIZATION TECHNIQUES FOR HIGH ACCURACY ISOTOPE DILUTION ANALYSES--APPLICATION TO MOLYBDENUM AND NICKEL IN STANDARD REFERENCE MATERIALS,
National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
L. J. Moore, L. A. Machlan, W. R. Shields, and E. L. Garner.
Analytical Chemistry, Vol 46, No 8, p 1082-1089, July 1974, 1 fig, 5 tab, 24 ref.

Descriptors: *Analytical techniques, *Molybdenum, *Nickel, Instrumentation chemical reactions, Laboratory tests, *Mass spectrometry, Isotope fractionation, *Pollutant identification.

General exact equations and iteration techniques were developed for internal normalization to eliminate the effect of thermal fractionation from isotope ratio measurements, and therefore isotope dilution analyses, by thermal ionization mass spectrometry. The techniques were applicable to more than 20 elements, and have been extensively applied to the determination of Mo in ore concentrates (55% Mo) and silicate trace standards (50 and 500 ppm Mo). The standard deviations of all internally corrected Mo isotope ratio measurements were less than 0.1%. The Mo sample size was 40 micrograms, but normalization techniques should apply to microgram and smaller samples with a more sensitive ion detection system. Procedures were described for the chemical separation of Mo from matrix interferences and

for the mass spectrometric analysis of Mo. Application of the techniques to Ni in three pollution Standard Reference Materials was described. (Jernigan-Vanderbilt)
W75-08081

SPECTROPHOTOMETRIC DETERMINATION OF IRON IN ACIDS AND ACIDIC SOLUTIONS BY AN EXTRACTION--FORMATION REACTION INVOLVING 3-(2-PYRIDYL)-5,6-DIPHENYL-1,2,4-TRIAZINE AS THE CHROMOGENIC EXTRACTION REAGENT,
Northern Illinois Univ., De Kalb. Dept. of Chemistry.
C. D. Chriswell, and A. A. Schilt.
Analytical Chemistry, Vol 46, No 8, p 992-996, July 1974. 5 fig, 6 tab, 14 ref.

Descriptors: *Iron, *Analytical techniques, *Spectroscopy, *Acids, Testing procedures, Laboratory tests, Instrumentation, *Pollutant identification.

A rapid, simple, and sensitive method was developed for the spectrophotometric determination of iron in acids and acidic solutions based upon the extraction-formation of tris (3-(2-pyridyl)-5,6-diphenyl-1,2,4-triazine)iron (II) thiocyanate. The basis of the method and effect of variables were investigated and elucidated. In general, the method is suitable for acid concentrations up to 4M, applicable to iron concentrations of parts per billion, and relatively free of interferences. The iron content of some reagent grade acids were reported. (Jernigan-Vanderbilt)
W75-08082

OXIDATION OF METAL SULFIDES BY THIOBACILLUS FERRO-OXIDANS GROWN ON DIFFERENT SUBSTRATES,
Laval Univ., Quebec. Department of Biochimie.
For primary bibliographic entry see Field 5C.
W75-08085

THE EFFECT OF SILVER IONS ON THE RESPIRATORY CHAIN OF ESCHERICHIA COLI,
British Columbia Univ., Vancouver. Dept. of Biochemistry.
For primary bibliographic entry see Field 5C.
W75-08086

SYNTHESES AND SPECTROPHOTOMETRIC STUDIES OF 5(2-PYRIDYLAZO) - 2,4-DIAMINOTOLUENE AND ITS DERIVATIVES AS ANALYTICAL REAGENTS, SPECTROPHOTOMETRIC DETERMINATION OF COBALT WITH 5-(3,5-DICHLORO-2-PYRIDYL)-2,4-DIAMINOTOLUENE),
Government Industrial Research Inst., Nagoya (Japan).
S. Shibata, M. Furukawa, and E. Kamata.
Analytica Chimica Acta, Vol 73, No 1, p 107-118, November, 1974. 8 fig, 5 tab, 9 ref.

Descriptors: *Heavy metals, *Cobalt, *Spectrophotometry, *Synthesis, *Analytical techniques, *Chelation, Steel, Gold, Copper, Zinc, *Pollutant identification, Mercury, Nickel.
Identifiers: *Pyridylazo dyes, *Molar absorptivities, *Ligand, Metal ions, Color reactions, Mercury (II), Nickel (II), Palladium, Thallium, Waspaloy, Meta-tolylene diamine group.

Seven pyridylazo dyes containing the m-tolylenediamine group were synthesized and their analytical potential for the determination of cobalt was studied spectrophotometrically. The molar absorptivities and selectivity of these reagents increased compared with those of 4-(2-pyridylazo)-1,3-diaminobenzene (PADAB). Cobalt (II) and 3,5-diCl-PADAT (5- (3,5-dichloro-2-pyridyl)azo-2,4-diaminotoluene) at pH3 form a complex which is very stable even in the presence of strong mineral acids. The complex has two absorption maxima at 548 and 590 nm in hydrochloric acid (2.4 m) solution. The color is very stable and the system conforms to Beer's law; the optimal range for measurement in a one cm is 0.01-0.4 ppm cobalt. In practice, this color reaction is specific. The molar absorptivity is 138,000 liters per mol cm at 590 nm. The sensitivity is 0.00042 micrograms Co per sq cm at 590 nm for log Io/I = 0.001. The method was applied to the determination of cobalt in steel and waspaloy. (Definer-Vanderbilt)
W75-08087

A STATIC MONITOR FOR LEAD IN NATURAL AND WASTE WATERS,
Vanderbilt Univ., Nashville, Tenn. Dept. of Chemistry.
A. N. Clarke, and J. H. Clarke.
Environmental Letters, Vol 7, No 3, p 251-260, 1974. 2 tab, 13 ref.

Descriptors: *Heavy metals, *Lead, *Monitoring, Wastewater(Pollution), *Clams, Freshwater, *Spectroscopy, Adsorption pollutants, Chelation, Mollusk, Shellfish, Leaching, Acids, *Pollutant identification.
Identifiers: *Atomic absorption, Plastic ware.

The experiment was originally designed to ascertain the extent to which leaching and adsorption mechanisms affect the final lead concentrations of a fresh water mollusk shell at pH above 7. The shells of the ubiquitous fresh-water mollusk Corbicula manillensis, commonly known as the Asiatic clam, were used to monitor the relative concentration and changes in concentration of lead over extended periods of time in natural and waste waters at a pH of 7 or above. The shells not only absorb lead from background waters, but the adsorption factors increase with increasing background water levels. These shells were especially good monitors of Pb in waters at pH of 7 or higher. Commercial plastic ware that was used in the study was a source of lead contamination. (Definer-Vanderbilt)
W75-08089

A PRELIMINARY APPROACH TO THE USE OF THE ISOTOPIC RATIO 13C/12C FOR THE EVALUATION OF MINERALIZATION IN AQUATIC ENVIRONMENTS,
Istituto Italiano di Idrobiologia, Pallanza.
For primary bibliographic entry see Field 5B.
W75-08090

MICRODETERMINATION OF METALS IN ORGANOMETALLIC COMPOUNDS BY THE OXINE METHOD AFTER CLOSED FLASH COMBUSTION,
Cairo Univ., Giza (Egypt). Microanalytical Unit.
A. B. Sakla, S. W. Bishara, and P. A. Hassan.
Analytica Chimica Acta, Vol 73, No 1, p 209-212, November, 1974, 1 tab, 21 ref.

Descriptors: *Metals, *Analytical techniques, *Calcium, *Copper, *Iron, *Nickel, *Aluminum, Synthesis, *Pollutant identification, Volumetric analysis.
Identifiers: Microdeterminations, Closed flask combination, *Organoiron compound, *Organonickel compound, Bismuth, Pharmaceutical industries, Petroleum industries.

The results of using the closed flask combustion method to determine, on the micro scale, Ca, Cu, Al, Fe, Bi, and Ni, are reported. Oxine is used as the organic chemical to bind the metals. The closed flask method did not offer great advantages over the wet digestion technique for decomposition or ogranoiron or organonickel compounds, but it is advantageous for the other metals listed. This should be important for synthetic organic chemistry, pharamaceutical and petroleum industries. (Delfiner-Vanderbilt)
W75-08091

HEAD HAIR SAMPLES AS INDICATORS OF ENVIRONMENTAL POLLUTION,
University Coll., Cork (Ireland).
J. P. Corridan.
Environmental Research. Vol 8, No 1, p 12-16, Aug., 1974, 25 ref.

Descriptors: *Heavy metals, *Lead, *Mercury, *Copper, *Zinc, *Arsenic compounds, Environment, Pollution, Rural areas, Air pollution, Analytic techniques, Spectrophotometry, Colorimetry, Dusts, Public health, Spectrophotometry, *Pollutant identification, Industrial wastes.
Identifiers: *Hair *Ireland, *Atomic absorption, Wet oxidation.

A brief account is given of the problems which may arise from open cast metal mining and the value of taking head hair samples to indicate environmental pollution. In an area in rural Ireland, of note were the comparatively high arsenic levels, the normal copper and zinc levels, and the low levels of lead and mercury. Head hair can be a useful indicator of environmental pollution by metals, the analysis of hair is of epidemiological importance. (Delfiner-Vanderbilt)
W75-08092

MICRODETERMINATION OF LEAD BY A FLUORESCENT RING-OVEN TECHNIQUE,
Andrija Stampar School of Public Health, Zagreb (Yugoslavia).
Z. Skuric, F. Valic, and J. Prpic-Marecic.
Analytica Chimica Acta, Vol 73, No 1, p 213-215, November, 1974, 8 ref.

Descriptors: *Lead, *Analytical techniques, *Fluorescence, *Air pollution, Ions, Assay, *Pollutant idenfication.
Identifiers: Microdetermination, *Ring-oven technique, Lead chlorocomplexes.

A combination of techniques that can be used for the determination of lead is discussed. The efficacy of the ring-oven technique for separating and concentrating trace amounts of lead, combined with the high fluorescence intensity of the lead chloro-complex in the adsorbed state, was found to provide a simple reasonably rapid procedure adaptable for air pollution studies. A total of 29 ionic species from Groups, I, II, III, IV, V, VI, VII, VIII were studied. In determining lead in air, the sensitivity of the fluorescent ring-oven technique is quite satisfactory not only for industrial environments, but also for outdoor atmospheres. (Delfiner-Vanderbilt)
W75-08093

FLUORESCENCE REACTIONS OF ERICHROME RED B WITH METALS, PART I DETECTION OF BE, MG, AL, IN, GA, AND ZN,
Madrid Univ. (Spain). Departamento de Quimica Analitica.
C. Perez Conde, J. A. Perez-Bustamante, and F. Burrielmarti.
Analytica Chimica Acta, Vol 73, No 1, p 191-193, November, 1974, 1 tab, 4 ref.

Descriptors: *Heavy metals, *Metals, *Fluorescence, *Dye releases, Analytical techniques, Spectroscopy, Pollutant identification.
Identifiers: *Erichrome red B, Reagents, Food stuffs.

The results of a search for possible new fluorescence reagents among a considerable number of azo dye stuffs were reported. Eriochrome red B was useful for the sensitive identification of the elements, Be, Mg, Al, In, Ga, and Zn. Neither thallium (I) nor thallium (II) gave any fluorescence in any of the media investigated. The media tested were hexamine, Hcl, NaOH, acetic acid-sodium acetate buffer. Erichrome red B appeared promising for qualitative identification

and possibility for some sensitive determinations. (Delfiner-Vanderbilt)
W75-08094

SOLUBILIZATION OF DIMETHYLMERCURY BY HALIDE IONS,
Missouri Univ., Rolla. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W75-08096

ANALYSES OF PHOSPHORUS IN LAKE ONTARIO SEDIMENT,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
For primary bibliographic entry see Field 5C.
W75-08122

KEYS TO WATER QUALITY INDICATIVE ORGANISMS (SOUTHEASTERN UNITED STATES),
Georgia State Coll., Atlanta.
For primary bibliographic entry see Field 5C.
W75-08146

FUNGI,
Georgia State Coll., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-08147

ALGAE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
For primary bibliographic entry see Field 5C.
W75-08148

OLIGOCHAETA,
Toronto Univ. (Ontario). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W75-08150

EPHEMEROPTERA,
Florida Univ., Gainesville. Dept. of Biological Science.
For primary bibliographic entry see Field 5C.
W75-08152

PLECOPTERA,
Massachusetts Univ., Amherst. Dept. of Entomology and Plant Pathology.
For primary bibliographic entry see Field 5C.
W75-08153

TRICHOPTERA,
Georgia Univ., Athens. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W75-08154

CHIRONOMIDAE,
Florida State Board of Health, Jacksonville.
For primary bibliographic entry see Field 5C.
W75-08155

FRESHWATER FISHES,
Auburn Univ., Ala.
For primary bibliographic entry see Field 5C.
W75-08156

DATA REQUIREMENTS OF A WATER QUALITY MANAGEMENT PROGRAM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-08213

SUSPENDED SOLIDS MONITOR,
Newark Coll. of Engineering, N.J.
J. W. Liskowitz, G. J. Franey, and J. Tarczynski.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 581, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-75-002, April 1975. 39 p, 14 fig, 6 tab, 6 ref. 1BB034/ROAP 21-ASY/TASK 037. 11024DZB (14-12-494).

Descriptors: Measurement, *Measuring instruments, Automatic control, Remote sensing, Flow control, Flow measurement, Remote control, *Water analysis, Monitoring, *Chemical analysis, *Instrumentation, Flow characteristics, Waste identification, Suspended solids.
Identifiers: Multiple light scatter, In situ measurement, *Suspended solids meter, Depolarization.

A method for measuring concentration of suspended solids in liquid media, based on depolarization of backscattered polarized light, has been developed and instrumented. Feasibility studies and field evaluation of the instrument, using sewage influent, effluent and sludge, showed that there is a specific relationship between concentration of solid particles and polarization ratio. The relationship is independent of size distribution and density of particles, color of particles or solution, sludge consistency, velocity, and build-up of solids on the optical window. The field evaluation results indicate that this instrument provides a continuous instantaneous in situ measurement of suspended solids concentrations in combined sewers and other wastewater flows. (EPA)
W75-08227

FORTRAN PROGRAMS FOR ANALYZING COLLABORATIVE TEST DATA, PART I: GENERAL STATISTICS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 7C.
W75-08230

FORTRAN PROGRAMS FOR ANALYZING COLLABORATIVE TEST DATA, PART II: SCATTER DIAGRAMS,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 7C.
W75-08231

DETECTION OF SHIGELLA IN WATERS USING AN IMMUNOFLUORESCENCE TECHNIQUE AND THE IMMUNO-INDIA-INK REACTION (GECK REACTION), (IN FRENCH),
Institute of Hygiene and Epidemiology, Hanoi (North Vietnam).
D. D. Nguyen.
Rev Epidemiol Med Soc Sante Publique, Vol 21, No 4, p 337-347, 1973, Illus.

Descriptors: *Analytical techniques, *Fluorescence, *Shigella sampling, Water pollution, Pollutants, Water pollution sources, Europe, Epidemiology, Water pollution effects, *Pollutant identification.
Identifiers: *Geck reaction, Hungary, India-Ink technique, *Immunofluorescence technique.

Detection of shigellae in Hungarian waters, using an immunofluorescence technique and the immuno-india-ink reaction (Geck reaction) is reported. This investigation was carried out on smears of centrifugation sediment, of filtration sediment and of enriched cultures obtained from 60 water samples. The fluorescent antibody tests revealed the presence of shigellae in 38.3% of the water samples, and the Geck reaction revealed their presence in 41.1%; shigellae were isolated in only 3.3% of the samples with the direct bacteriological method. The 3 types of samples gave similar results. Compared with the immunofluorescene and the direct bacteriological methods, the Geck reaction was very accurate and as specific as the 2 other methods, but essentially quicker than the classical techniques. The Geck reaction has a great epidemiological value. It is simple, inexpensive and could easily be used in all bacteriological laboratories.--Copyright 1974, Biological Abstracts, Inc.
W75-08244

SPECTROPHOTOMETRIC DETERMINATION OF CYCLOHEXANONE IN BODIES OF WATER,
Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR).
K. O. Lastochkina.
Gig Sanit, Vol 38, No 1, p 68-70, 1973.

Descriptors: *Water pollution, Analytical techniques, *Spectrophotometry, Sampling, Infrared radiation, *Pollutant identification.
Identifiers: IR spectrophotometry, *Cyclohexanone.

Apparatus and methods for the determination of cyclohexanone in polluted water by IR spectrophotometry are described. The water samples are distilled from 500 - 100 ml of sample and CCl4 is added during the extraction. The extract is transferred into a cuvette with KBr. The method is suitable for the determination of cyclohexanone in a concentration range of 0.1-10 mg/l.--Copyright 1974, Biological Abstracts, Inc.
W75-08248

THE DETERMINATION OF 2H2O IN WATER AND BIOLOGICAL FLUIDS BY GAS CHROMATOGRAPHY,
Ceskoslovenska Akademie Ved, Brno. Ustav Instrumentalni Analyticke Chemie.
For primary bibliographic entry see Field 2K.
W75-08264

COMMUNITIES OF OLIGOCHAETA AS INDICATORS OF THE WATER QUALITY IN LAKE HJALMAREN,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5B.
W75-08267

CHANGE OF FEEDING OF THE GROUSE UNDER THE EFFECT OF DRAINAGE RECLAMATION, (IN RUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
For primary bibliographic entry see Field 2I.
W75-08269

MEASUREMENT OF MICROBIAL OXIDATION OF METHANE IN LAKE WATER,
Manitobe Univ., Winnipeg. Dept. of Microbiology.
J. W. M. Rudd, R. D. Hamilton, and N. E. R. Campbell.
Limnol Oceanogr, Vol 19, No 3, p 519-530, 1974, Illus.
Identifiers: Cells, Lakes, Measurement, *Methane, Microbial oxidation, Oxygen, *Radioactive, Tracers.

A radiotracer method which measures rates of oxidation of methane to cell material, extracellular products, and carbon dioxide was applied to 2 lakes and indicates that methane oxidation occurs in a narrow band where methane and O2 occur together in the water column. Oxidation rates of 1.0 micromolar/hr were recorded in a eutrophic lake; rates in a meromictic lake reached 0.15 micromolar/hr. Usually 1/3 of the C from oxidized methane was found in cell material and extracellular products and the rest was converted to CO2. This ratio changed at very low O2 concentrations.--Copyright 1974, Biological Abstracts, Inc.
W75-08323

SOME OBSERVATIONS ON DIRECT COUNTS OF FRESHWATER BACTERIA OBTAINED WITH A FLUORESCENCE MICROSCOPE,
Freshwater Biological Association, Ambleside (England).
J. G. Jones.
Limnol Oceanogr, Vol 19, No 3, p 540-543, 1974.
Identifiers: Acridine, *Bacteria, Counts, Cyanates, Dyes, Euchrysine, Fluorescence, Microscopes, *Fluorescein microscope, *Pollutant identification.

The use of different fluorochromes for direct counts of bacteria in water was compared. The 2 dyes in most common use, acridine orange (AO) and fluorescein isothiocyanate (FITC) were compared with an acridine derivative, euchrysine 2GNX (E-2GNX). Minor changes in technique could produce significant differences in counts. The acridine based dyes were easier to apply than FITC, and of these, E-2GNX gave consistently higher counts all at a final dye concentration of 5 mg 1-1 with a contact time of 3 min. Details of the method should be consulted since changes can produce opposite results.–Copyright 1974, Biological Abstracts, Inc.
W75-08325

ACCUMULATION, RELEASE AND RETENTION OF PETROLEUM HYDROCARBONS BY THE OYSTER CRASSOSTREA VIRGINICA,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W75-08331

EFFECTS OF WATER HARDNESS ON THE TOXICITY OF SEVERAL ORGANIC AND INORGANIC HERBICIDES TO FISH,
For primary bibliographic entry see Field 5C.
W75-08332

5B. Sources Of Pollution

FATE AND EFFECTS OF TRACE ELEMENTS IN SEWAGE SLUDGE WHEN APPLIED TO AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
A. L. Page.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-231 171, $5.25 in paper copy, $2.25 in microfiche. National Environmental Research Center, Cincinnati, Ohio, EPA Report No EPA-670/2-74-005, January, 1974, 106p, 33 tab, 107 ref.

Descriptors: *Reviews, *Trace elements, *Sewage sludge, Agriculture, *Soil amendments, Sludge disposal, *Path of pollutants, Soil contamination, Soil chemical properties, Toxicity, Molybdenum, Manganese, Copper, Zinc, Nickel, Cadmium, Cobalt, Chromium, Lead, Boron, Mercury, Arsenic compounds, Heavy metals.

An evaluation was made of potential problems associated with the long-term (decades) application of sewage treatment plant wastes on land resulting in the accumulation of toxic concentrations of trace elements. This evaluation was based on published information, and included the following trace elements: Mo, Mn, Ba, Cu, Zn, Ni, Cd, Co, Sn, Cr, Pb, V, B, Hg, As, Se, and Ag. Total concentrations of trace elements in sewage sludges vary widely as determined from the ranges reported from approximately 300 treatment plants in the U.S.A., Canada, Sweden, England, and Wales. Trace element concentrations in the aqueous phase of sludges may exceed those predicted from solubility product considerations indicating that soluble trace element-organic complexes occur in liquid sludges. Field and greenhouse studies demonstrated that yields and trace element concentrations of higher plants grown on sludge amended soils are dependent on the amount of sludge applied trace element composition of the sludge, soil pH, and plant species. Applications of most sludges at a rate of 400 m tons/ha if mixed uniformly thoughout the surface 15 cm will add more Cd, Cu, Hg and Zn than is normally present in natural soils. The mobility of the various elements was also discussed. (Pulliam-Vanderbilt)
W75-07852

GENESIS OF HYDROGEOCHEMICAL FACIES OF GROUND WATERS IN THE PUNJAB REGION OF PAKISTAN,
Geological Survey, Washington, D.C.
P. R. Seaber, W. Back, C. T. Rightmire, and R. N. Cherry.
In: Proceedings of International Symposium on Development of Ground Water Resources, Nov. 26-29, 1973, Madras, India, Vol 6, p 9-20, 1974. 5 fig, 7 ref.

Descriptors: *Water pollution sources, *Geochemistry, *Return flow, *Evaporation, *Water chemistry, Carbon radioisotopes, Calcium, Sodium, Magnesium, Chlorides, Sulfates.
Identifiers: *Punjab(Pakistan).

Principles and techniques of hydrogeochemistry and isotopic hydrology were applied to a selected area of the Punjab Region of Pakistan. The distribution of the deuterium and oxygen isotopic composition permits delineation of areas in Rechna Doab in which either the Ravi River or the Chenab River contributes to the groundwater today, on the basis of the Ravi River water being isotopically heavier. Mid-Doab waters show the results of mixing and evaporation of the two river waters. Carbon-14 concentrations show the waters to have a modern age. Most of the groundwater is recycled irrigation water, and the chemical reactions resulting from transpiration and evaporation are a major control in its chemical composition. Calcium has three sources: (1) river water draining calcareous rocks at higher elevations; (2) solution of calcareous minerals; and (3) original evaporites in the Punjab Alluvium of the Indus Plain. Sodium is derived chiefly from solution of evaporites and secondarily from dissolution of silicates. The major source of magnesium is the dissolution of calcite and dolomite. Chloride is derived primarily from solution of evaporites, evaporite dust particles, and rainfall. Bicarbonate is derived from five major sources: (1) infiltration of river water; (2) dissolution of secondary soil evaporites; (3) dissolution of calcareous minerals; (4) sulfate reduction; and (5) silicate buffering. Sulfate is derived almost entirely from the solution of gypsum and anhydrite. (Knapp-USGS)
W75-07865

NATURAL AND MODIFIED PLANT COMMUNITIES AS RELATED TO RUNOFF AND SEDIMENT YIELDS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4C.
W75-07866

BIOLOGICAL AND CHEMICAL ASPECTS OF THE SAN FRANCISCO BAY TURBIDITY MAXIMUM,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2L.
W75-07870

KARST HYDROLOGY OF NORTHERN YUCATAN PENINSULA, MEXICO,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 2F.
W75-07873

MOVEMENT OF SPILLED OIL AS PREDICTED BY ESTUARINE NONTIDAL DRIFT,
Geological Survey, Menlo Park, Calif.
T. J. Conomos.
Limnology and Oceanography, Vol 20, No 2, p 159-173, March 1975. 5 fig, 1 tab, 37 ref.

Descriptors: *Path of pollutants, *Oily water, *California, *Oil spills, Oil pollution, Water pollution, Currents(Water), Water circulation, Estuaries, Bays, Aquatic drift.
Identifiers: *San Francisco Bay(Calif).

The movement of oil spills was studied using information on water movement obtained from bimonthly releases of surface and seabed drifters in the San Francisco Bay and adjacent Pacific Ocean. River-induced nontidal estuarine circulation was the dominant factor controlling net movement of oil accidentally spilled at the entrance of the bay system, reinforcing ebbing tidal currents and causing the seaward movement of floating oil, which followed paths taken by surface drifters released 3 weeks before the spill. Some oil formed globules which sank to the near-bottom waters, had the same relative buoyancy as seabed drifters, and moved similarly, beaching in eastern San Pablo Bay after being transported landward in the near-bottom waters. No oil or surface drifters floated into the south bay because surface waters were drifting seaward, away from the south bay. Notable seasonally modulated phenomena which must be considered in predicting surface and near-bottom oil drifts include a summer (low-river discharge period) diminution of the estuarine circulation mechanism in the north and central bay-adjacent ocean region and a seasonal reversal in two-layer drift in the south bay. (Knapp-USGS)
W75-07877

HARMONIC ANALYSIS OF STREAM TEMPERATURES,
Geological Survey, Reston, Va.
T. D. Steele.
Availability from NTIS, Springfield, Va 22161 as PB-239 016. Price $4.25 printed copy; $2.25 microfiche. Computer Contribution, December 1974. 53 p.

Descriptors: *Computer programs, *Water temperature, Statistics, Water quality, Regression analysis, Fourier analysis.
Identifiers: *Harmonic analysis.

This computer program is one of a series of programs in the USGS SYSLAB system for data analysis of water-quality records. This special-purpose program was developed for harmonic analysis of water-quality constituent records, primarily stream-temperature data. It includes certain alternative-input and data-analysis capabilities not normally contained in more general statistical-analysis systems. The program, by means of a simple-harmonic regression function, is used to depict graphically and analytically the annual seasonal cycle of stream-temperature variability. Additionally, it may be applicable to characterize other water-quality time-dependent variables. The data-input alternatives to the program include options for analysis of both periodic (intermittent) measurements and daily (continuous) records. Appropriate adjustments are made in the harmonic curve-fitting procedure to compensate for missing values or gaps in a given record. Harmonic functins may be determined for either single- or multiple-year records, and alternatives in terms of detail of computer output are described and illustrated. Options are also available for calculating and graphically depicting correlograms or for determining Hurst coefficients of the constituent or harmonic-residuals time series. A source-deck listing, alternative data-set cluster options, and resultant line-printer outputs depicting the several operational modes and options of modes and options of the program are provided as attachments to this computer-program documentation. (Knapp-USGS)
W75-07882

ONE-DIMENSIONAL STREAM EXCESS TEMPERATURE ANALYSIS,
Geological Survey, Bay Saint Louis, Miss.
D. P. Bauer, and E. Mackenroth.
Available from NTIS, Springfield, Va 22161 as PB-238 965 Price $3.75 printed copy, $2.25 in microfiche. Computer Contribution, November 1974. 35 p.

Descriptors: *Computer programs, *Mathematical models, *Path of pollutants, *Thermal pollution, Mixing, Heated water, Water temperature, Water cooling.

A one-dimensional stream excess temperature model predicts the decay of waste heat in natural streams for the so-called 'far region' of stream temperature analysis. The technique, which is most useful in situations where the waste heat is approximately well mixed laterally and vertically, may also be used to describe the distribution of other soluble contaminants. The computer program is based on a one-dimensional stream excess temperature model. A general surface exchange equation is used in the model. (Knapp-USGS)
W75-07883

ENVIRONMENTAL TRITIUM IN THE EDWARDS AQUIFER, CENTRAL TEXAS, 1963-71,
Geological Survey, Reston, Va.
F. J. Pearson, Jr., P. L. Rettman, and T. A. Wyerman.
Open-file report 74-362, January 1975. 32 p, 8 fig, 4 tab, 13 ref.

Descriptors: *Tritium, *Tracers, *Groundwater movement, *Texas, Aquifers, Hydrogeology, Hydrologic data.
Identifiers: *Edwards aquifer(Texas).

Tritium concentrations of samples from 50 wells and springs in the Edwards aquifer in the San Antonio area of Texas were analysed. Tritium now in the aquifer is partly natural tritium, but most is tritium produced by thermonuclear tests in the 1950's and early 1960's. The tritium levels in precipitation and streams recharging the Edwards were also determined for comparison with the groundwater data. In general, tritium distribution within the Edwards confirms the accepted pattern of water flow within the aquifer. Concentrations of greater than 20 tritium units occur in the recharge areas, while less than 1 tritium unit is present along the aquifer's southern and southeastern boundary. (Knapp-USGS)
W75-07885

NATURAL DISTRIBUTION OF TRACE METALS IN SEDIMENTS FROM A COASTAL ENVIRONMENT, TOR BAY, ENGLAND,
Imperial Chemical Industries Ltd., Brixham (England). Brixham Research Lab.
For primary bibliographic entry see Field 2L.
W75-07895

DISTRIBUTION OF MICROBIAL ADENOSINE TRIPHOSPHATE IN SALT MARSH SEDIMENTS AT SAPELO ISLAND, GEORGIA,
Georgia Univ., Athens. Dept. of Microbiology.
R. R. Christian, K. Bancroft, and W. J. Wiebe.
Soil Science, Vol 119, No 1, p 89-97, January 1975. 2 fig, 5 tab, 32 ref. NSF Grant GA-35793X.

Descriptors: *Sediments, *Salt marshes, *Biomass, Marsh plants, Coastal marshes, Aquatic environment, Soils, Soil chemical properties, Soil analysis, Soil chemistry, Sedimentology, Carbon, Nitrogen, Nutrients, *Georgia, *Path of pollutants.
Identifiers: Adenosine triphosphate, Sapelo Island(Geo).

The vertical distribution of microbial adenosine triphosphate (ATP) was determined seasonally for sediments of the salt marsh at Sapelo Island, Georgia. Two study areas were chosen representing major differences in productivity of the marsh grass, Spartina alterniflora. The streamside zone represented an area of greater production of S. alterniflora than did the high marsh zone. In all cases the concentration of ATP was greatest in the surface 1 cm and decreased with increasing depth. ATP varied seasonally in both regions. A comparison was made of the sediments organic carbon and total nitrogen within the sediments and the calculated carbon and nitrogen associated with the microbial community. The contribution of these elements within the microbial community was at most a few percent of the total pools. The surface sediment ATP values reported were within the range of those for water-logged sediments from various diverse environments. (Sims-ISWS)
W75-07899

SUBMERGED SOILS IN THE NORTHWESTERN MEDITERRANEAN SEA AND THE PROCESS OF HUMIFICATION,
Centre Universitaire de Perpignan, Moulin a Vent (France). Centre de Recherches de Sedimentologie Marine.
F. Gadel, G. Cahet, and A. J. M. Bianchi.
Soil Science, Vol 119, No 1, p 106-112, January 1975. 1 fig, 20 ref.

Descriptors: *Sediments, *Organic matter, *Lagoons, Sedimentology, Benthic fauna, Humic acids, Marine geology, Chemistry, Soils, Estuaries, Biology, Geochemistry, Geography, Soils, Oceans, Water pollution sources.
Identifiers: *Mediterranean Sea, France.

Detailed information was given on the analysis of accumulation and humification of organic material in marine and lagoonal sediments in various areas of the northwestern Mediterranean Sea. Typical geographic and hydrodynamical conditions such as the absence of tides, sudden climatic variations, and discharge of low-water rivers and strong floods govern the geological situation. In contrast to the coastal and lagoonal sediments, the sediments of the open sea are only slowly accumulating without a major contribution by deposition and humification of organic substances. Abundant biological activity directly influencing the geochemical situation in the sediment takes place only in lagoons (such as the Etang de St. Nazaire and the Bages-Sigean complex), and certain parts of the coastal zone (including the Bay of Port Vendres, the Gulf of Marseille, and the Banyuls region). Geochemical analysis on carbon content, sulfur compounds present, nitrogen content, and humus characterization, as well as biomass estimation and bacterial counts from the investigated areas, were reported. Major biopedological factors involved were found to be temperature, presence or absence of oxygen, activity of benthic organisms, and concentration of organic matter. With increasing depths of burial, the biogeochemical alterations were found to slow down. (Sims-ISWS)
W75-07900

THE DISTRIBUTION OF SALINITY AND TEMPERATURE IN THE CONNECTICUT RIVER ESTUARY,
Connecticut Univ., Groton. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2L.
W75-07922

POND WATER QUALITY IN A CLAYPAN SOIL,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
E. C. Dickey, and J. K. Mitchell.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 106-110, January-February 1975. 8 fig, 2 tab, 14 ref.

Descriptors: *Farm ponds, *Water quality, *Pollutants, Ponds, Water supply, Domestic water, Runoff, Vegetation, Bacteria, Nitrates, Ammonia, Nitrogen, Livestock, Sampling, On-site investigations, *Illinois.

A field inspection was made of Washington County, Illinois, ponds having three basic types of watersheds: (1) those containing ungrazed pasture or trees, (2) those having cultivated land, and (3) those consisting primarily of a livestock exercise area. Ten watersheds were selected for this study. Watershed types greatly influence the amount of nitrate nitrogen occurring in farm pond water. Grassed and cultivated watershed pond water reached a maximum nitrate nitrogen level of 2.84 mg/l. Ponds having livestock on the watershed exceeded the public health standard of 10 mg/l nitrate nitrogen with one pond reaching a maximum level of 22.0 mg/l on one occasion. Ponds having few nutrients applied in the form of animal wastes on the watershed reached maximum levels of nitrate during early spring. Ponds with dense livestock concentrations on the watershed reached maximum levels in late fall after intense runoff events. Pond water for human consumption would need some type of treatment for bacteria. Pond water is at present the most reliable source for drinking water for animals in Washington County. Farm ponds having grassed or cultivated watersheds could provide water of acceptable quality to replace existing high-nitrate wells or low-yielding wells. (Sims-ISWS)
W75-07924

WATER AND SALT TRANSFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
K. K. Tanji, D. W. Henderson, S. K. Gupta, M. Iqbal, and A. F. Quek.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 111-121, January-February 1975. 8 fig, 3 tab, 10 ref. UCAL W-438.

Descriptors: *Water transfer, *Surface-groundwater relationships, *Saline water intrusion, *Salt balance, *Hydrogeology, *Irrigation effects, Saline water-freshwater interfaces, Hydrology, Salinity, Irrigation, Water quality, Connate water, Geohydrologic units, Geology, *California, Model studies, Water table, Return flow.
Identifiers: *Sutter Basin(Calif), Crop root zone.

An analysis of water and salt transfers was conducted in Sutter Basin, California. The average drainage index for the hydrologic years 1964-1972 was estimated as 0.42 + or -0.08 and the average salt balance index for the hydrologic years 1970-1972 as 2.59 + or -1.25. For the 1970 hydrologic year, the flow-weighted average surface input of salts (precipitation and irrigation water) was 0.74 tons per ha-m and the surface output (return flow) was 5.08 tons per ha-m. About 40% of the water and 70% of the salt load in the return flow was estimated to have originated from subsurface origins, mainly rising connate water. (Terstriep-ISWS)
W75-07925

DETERMINING AMBIENT WATER TEMPERATURES,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
M. Markofsky, and R. C. Binkerd.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings Paper 11171, p 361-366, March 1975. 2 fig, 1 tab, 1 append.

Descriptors: *Water quality control, *Water temperature, *Hydrography, *Powerplants, Heated water, Mixing, Solar radiation, Statistical methods, *Thermal pollution, Thermal water, Water pollution control, Water quality standards, Hydraulics, Regulation, Lakes, Estuaries.

Regulations concerning discharge of condenser cooling water from power plants frequently refer

to temperature rises above ambient temperature. Some ambiguities are attached to the definition of 'ambient' if both time and space factors for a given control region are not considered. A method to determine ambient temperature from statistical analysis of preoperational temperature records and the uncertainty of determining ambient temperature expressed in confidence limits was reviewed in regard to temperature criteria. Temporal and spatial variations in temperature records were examined. Data from an application to an estuary, including preoperational estimates and post operational measurements, were presented. (Harmeson-ISWS)
W75-07929

GROUND-WATER POLLUTION BY WOOD WASTE DISPOSAL,
Oregon State Engineer's Office, Salem.
H. R. Sweet, and R. H. Fetrow.
Ground Water, Vol 13, No 2, p 227-231, March-April 1975. 6 fig, 1 tab, 10 ref.

Descriptors: *Groundwater, *Water pollution, *Groundwater movement, *Unconsolidated aquifers, Malenclaves, Leachate, Industrial wastes, *Wood wastes, Lignins, *Oregon.
Identifiers: Mid-Willamette Valley, Lignin-tannins.

Timber production and wood products industries in the Mid-Willamette Valley of Oregon annualy dispose of about 547,000 tons of wood and bark wastes. Land storage or disposal of these wastes can result in the generation of significant volumes of leachate. Wood waste leachates are commonly characterized by lignin-tannin (measured as tannic acid), oxygen demanding materials, color, and odor. In this study, lignin-tannin concentrations in the groundwater ranged as high as 7.5 mg/l; iron and manganese were also shown to increase markedly relative to natural background concentrations, ranging as high as 13 mg/l and 106 mg/l, respectively. In August 1972 the area affected by the contaminated groundwater covered about 4 acres and extended nearly 1000 feet downgradient from the disposal site. By late January 1973 the plume had migrated latterally to affect an area of about 15 acres while extending over 1500 feet downgradient. The lateral migration was attributed to a seasonal change in the local flow system. At least eleven existing domestic water-supply wells have been rendered nonpotable by this pollution. (Gibb-ISWS)
W75-07951

PROCEEDINGS OF THE SEMINAR ON ADVANCED WASTEWATER TREATMENT AND DISPOSAL,
Nassau-Suffolk Regional Planning Board, N. Y. Regional Marine Resources Council
For primary bibliographic entry see Field 5D.
W75-07954

THE LONG ISLAND WATER SITUATION,
Geological Survey, Mineola, N.Y. Water Resources Div.
P. Cohen.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10, 1971 at Hauppauge, N.Y., p 5-17, (1972) 5 fig, 1 tab.

Descriptors: Groundwater, Areal hydrology, *Groundwater resources, *Saline water intrusion, *Natural recharge, *Water quality, Groundwater recharge, Glacial aquifers, Aquifer characteristics, Groundwater availability, Recharge, Water source, Water supply, Groundwater movement, Water table, Water level fluctuations, *New York.
Identifiers: *Long Island(NY), Nassau County(NY), Suffolk County(NY).

Rapid population growth to nearly 7 million, especially at the western end of 120-mile by 20-mile Long Island, has caused significant deterioration in both quality and quantity of groundwater resources. The Island has a tremedous groundwater supply, accumulated over centuries from the average annual precipitation of 44 inches. Water percolates into the glacial deposits of fine sand, silt, clay, and some coarse sand and gravel which underlie the island at an average rate of approximately 1 mgd (million gallons per day) square mile. It gradually flows down gradient from the central hills toward the edges of the island where fresh water in contact with salty groundwater forms a zone of diffusion. Lacation of this zone depends on the height of the water table above sea level and the rate of subsurface outflow of fresh water. Man has decreased the groundwater reservoir, causing salt water intrusion, by pumping and discharge of sewage water directly to tidewater. These developments, along with construction of impermeable surfaces which prevent aquifer recharge, accompany urbanization. Contamination has come from agriculture, industrial discharges, and the nearly one half million septic tanks. Synthetic detergents and increased quantities of nitrates are now found in drinking water. Increased sewering and decreasing agriculture will probably decrease pollution of the groundwater, although these gains may be partially offset by contamination from lawn fertilizers in suburban developments. (See also W75-07954) (Herr-North Carolina)
W75-07955

THE STATUS OF WASTEWATER TREATMENT ON LONG ISLAND,
Suffolk County Dept. of Environmental Control, N.Y.
For primary bibliographic entry see Field 5D.
W75-07957

SPRINKLER IRRIGATION FOR LIQUID WASTE DISPOSAL,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 5D.
W75-07959

LOW WINTER DISSOLVED OXYGEN IN SOME ALASKAN RIVERS,
Environmental Protection Agency, Arctic Environmental Research Lab. College, Alaska.
E. W. Schallock, and F. B. Lotspeich.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $0.85. Environmental Protection Agency, Report EPA-660/3-74-008, April 1974. 33 p, 11 fig, 3 tab, 36 ref.

Descriptors: *Dissolved oxygen, *Alaska, *Rivers, Winter, *Seasonal, Conductivity, Alkalinity, Hydrogen ion concentration, Water temperature, Water quality standards, Arctic, Subarctic, *Pollutant identification, *Water pollution sources.
Identifiers: Low dissolved oxygen, Yukon-River(Alas), Sagawanirktok River(Alas), Chena River(Alas).

Water samples collected during the years 1969 through 1972, from 36 selected Alaskan rivers were analyzed for dissolved oxygen, pH, conductivity and alkalinity. Dissolved oxygen (D.O.) ranged from 0.0 to 15.3 ml/l (106 percent saturation); pH from 6.2 to 8.4; conductivity varied from 105 to 3000 (umho/cm); and alkalinity from 28 to 410 (mg/l). Severe D.O. depletion during winter was found in many river systems large and small, and located in a range of latitudes (70 degrees N to 61 degrees N). Sufficient data were collected on the Chena, Chatanika, and Salcha Rivers to reveal annual D.O. trends: near saturation during spring 'breakup' and fall 'freezeup when water temperatures are near 0C; somewhat lower D.O. concentrations during warm water summer periods; and yearly minimum concentratioes during the winter (January-March) interval. D.O. depression begins in October and continues into February. D.O. from stations near the mouth of a river were generally depressed more than at upper stations. The latter trend was observed in the Yukon River which contained 10.5 mg/l (73 percent saturation) at the Canadian Border but only 1.9 mg/l (13 percent) near the mouth. pH gradually decreased in some rivers although alkalinity and conductivity increased. The depressed winter D.O. concentrations and low winter discharge in many Alaskan rivers are more severe and widespread than present literature indicates. Winter conditions may already limit aquatic organisms in some systems. (EPA)
W75-07966

MICROBIAL DEGRADATION AND ACCUMULATION OF PESTICIDES IN AQUATIC SYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
D. F. Paris, D. L. Lewis, J. T. Barnett, Jr., and G. L. Baughman.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 293, $4.25 in paper copy, $2.25 in microfiche. Report EPA-660/3-75-007, March 1975. 45 p, 9 fig, 5 tab, 55 ref. 1BA023.

Descriptors: *Biodegradation, *Sorption, *2,4-D, Aquatic microorganisms, Pesticide kinetics, *Pesticide residues, Hydrolysis, Metabolism, Bacteria, Fungi, *Microbial degradation, Water pollution sources, Water pollution effects.
Identifiers: *Malathion, *Methoxychlor, *Toxaphene, *Carbaryl.

The microbial degradation and sorption of carbaryl, malathion, butoxyethyl ester of 2,4-dichlorophenoxyacetic acid (2,4-DBE), methoxychlor, atrazine, diazinon, captan, parathion, and toxaphene were investigated. Malathion and 2,4-DBE were found to undergo transformation readily in both bacterial and fungal cultures. Degradation of malathion and 2,4-DBE at low concentrations (< 1 mg/l) in batch cultures of bacteria followed second-order kinetics as predicted by the Michaelis-Menten theory. A single isomer, betamonoacid of malathion, was the primary metabolite in transformation of malathion by both bacterial and fungal populations. The major metabolite found in 2,4-DBE studies was 2,4-D. Carbaryl underwent chemical hydrolysis to alpha-naphthol in both heterogeneous bacterial cultures and uninoculated controls. In the cultures alpha-naphthol was metabolized to 1,4-naphthoquinone and two unidentified compounds. Bacterial degradation of methoxychlor was slower than bacterial degradation of malathion or 2,4-DBE. The insecticide was metabolized to methoxychlor-DDE. Rapid and extensive sorption of pesticides to fungi, bacteria, and algae was observed and methoxychlor and toxaphene, but not with any of the other pesticides investigated. Distribution coefficients for methoxychlor ranged from 1.2 x 1000 to 4.8 x 10,000 for the different organisms whereas the coefficients for toxaphene ranged from 3.4 x 1000 to 1.7 x 10,000. Captan underwent neither microbial degradation nor sorption because of its rapid hydrolysis in water. (EPA)
W75-07970

PHOSPHORUS UPTAKE AND RELEASE BY LAKE ONTERIO SEDIMENTS,
Wisconsin Univ., Madison. Water Chemistry Program; and Wisconsin Univ., Madison. Dept. of Soils.
For primary bibliographic entry see Field 5A.
W75-07972

CHANGE IN THE CHEMISTRY OF NATURAL WATERS IN LANDSCAPES UNDER AGRICULTURAL USE,
G. S. Shil'krot.

Soviety Hydrology, Selected Papers No 3, p 258-264, 1973, 2 tab, 26 ref. Translated from Izvestiya Akad, nauk SSSR, Ser geograf No 3, p 42-50, 1973.

Descriptors: *Water quality, *Drainage effects, *Water pollution sources, Agricultural chemicals, Fertilizers, Groundwater, Nitrogen, Phosphorus, Runoff, Precipitation(Atmospheric), Surface runoff, Surface waters, Soil water, Agricultural runoff, Chlorides, Sulfates, Carbonates.
Identifiers: *USSR.

Some characteristic changes in the chemical composition of groundwater and surface runoff and precipitation, produced by human activity and leading to an increase in the content of phosphorus and nitrogen compounds and also of chlorides and sulfates in the natural waters of landscapes under agricultural use, were investigated. The changing role of soils in the composition of natural waters as a result of intense chemical action of agriculture was analyzed along with the effect of domestic and industrial wastes. The content of nitrogen and phosphorus compounds increased in the surface runoff from fields after prolonged application of large amounts of mineral fertilizers. The nitrogen content increased sharply in groundwaters under plowed and fertilized fields. The mineral content of groundwaters increased sharply near populated points as did the content of chlorides, sulfates, and the concentration of biogenic substances. The content of nitrogen, phosphorus, and sulfur also increased in precipitation because of human activity; this resulted in an increased supply of individual chemicals to natural waters in areas remote from large populated areas. All these unfavorable changes in the chemical composition of natural waters demand a reduction of anthropogenic effects. Domestic and industrial wastes, in which the concentration of water pollutants is especially high, must be completely purified. As for agricultural return waters, their removal of nitrogen and phosphorus compounds from fertilized fields can be reduced by proper agricultural practices, i.e., soil cultivation, selection of crops under rotation, times of fertilizer application, etc., which reduce losses of fertilizers added to the soil. (Humphreys-ISWS)
W75-07974

GROUND-WATER QUALITY RELATED TO IRRIGATION WITH IMPORTED SURFACE OR LOCAL GROUND WATER,
Agricultural Research Service, Fresno, Calif.
H. I. Nightingal, and W. C. Bianchi.
Journal of Environmental Quality, Vol 3, No 4, October-December, 1974. p 356-361, 2 tab, 7 fig, 13 ref.

Descriptors: *Imported water, *Irrigation water, *Groundwater, Surface waters, *Arid lands, *Irrigation, *Water quality, Irrigation wells, Electrical conductance, Chlorine, Nitrates, Salinity, Sampling, Statistical methods, Water reuse, Irrigation canals, Water sources.

Groundwater quality in an arid irrigated area that imports high quality surface water was compared with an adjacent up-gradient area that uses local pumped groundwater. Intensive sampling of the groundwater in irrigation and domestic wells done in fall, 1972, showed that the electrical conductivity, NO3- and Cl- concentrations had not significantly changed since 1967. Results of nonparametric statistical tests show that continued use of local groundwater for irrigation has resulted in electrical conductivity, NO3- and Cl- concentrations 9.5, 18.6, and 91.8 percent higher, respectively, than the area using mostly high quality surface water for irrigation. Areas of higher groundwater NO3- and Cl- were generally related to soil drainge-recharge and agricultural use . The use of supplemental surface water supplies will be necessary to reduce increases in electrical conductivity, NO3-, and Cl- concentrations caused by the exclusive use of low quality local groundwater (Mastic-Arizona)
W75-07978

WINTER-REGIME SURFACE HEAT LOSS FROM HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
P. P. Paily, E. O. Macagno, and J. F. Kennedy.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 941, $6.25 in paper copy, $2.25 in microfiche. ITHR Report No 155, March 1974. 137 p, 23 fig, 18 tab, 207 ref, 1 append. OWRT B-018-IA(3).

Descriptors: *Evaporation, *Solar radiation, *Radiation, *Heat flow, *Air-water interfaces, Equations, *Thermal pollution, Heat, Winter, Climatic data, Humidity, Model studies, Heat transfer, Streams.
Identifiers: Empirical analysis.

Evaluation of the rate of surface heat exchange between the water and air has become very significant because of the need to determine the thermal response of streams to heat inputs. The different mechanisms of heat exchange that contribute to the total heat exchange were discussed and the various empirical formulas to compute each of the components, as developed by various investigators, were presented and discussed. The suitability of each empirical formula was examined. The methods to linearize the total heat exchange rate were reviewed and a new linearized relation was proposed. General equations, suitable for winter-regime conditions, were presented to compute the coefficients of the linearized heat loss model. (Adams-ISWS)
W75-07990

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: WATER QUALITY MODELING,
Washington State Univ., Pullman. Dept. of Civil Engineering.
W. B. Betchart.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 940, $4.25 in paper copy, $2.25 in microfiche. Washington Water Research Center, Pullman, Report No 17D, November 1974. 50 p, 3 fig, 6 tab, 15 ref. OWRT B-036-WASH(5), B-043-WASH(5), B-050-WASH(5).

Descriptors: *Model studies, Systems analysis, Watershed management, River basin development, Water quality, *Mathematical models, Water resources, Planning, Dissolved oxygen, Temperature, *Washington.
Identifiers: *Yakima River basin(Wash), *Water quality models.

A study of water quality modeling as a planning tool has been conducted with specific reference to the Yakima River in central Washington. Four different water quality models have been developed for use in planning of the Yakima Water Quality. Each model permits progressively more parameters to describe river water quality. Available data were found to be the limiting factor in model development and calibration. A particularly important limitation was precise data on the hydraulic characteristics of the river at various specific low flows. Two general types of use for models have been identified: (1) as a description of a real world situation or expected situation which constitutes a water quality problem (problem definition) or (2) to predict the results of a possible problem-solving action. These models indicate relative rather than absolute response of water quality to various action unless the extensive input data requirements can be satisfied. Each of the four models is applied to the Yakima in the problem definition mode and their strengths and weaknesses in this use are assessed. A general strategy for obtaining and using such models is also described.
W75-07995

OPTIMAL COST DESIGN OF BRANCHED SEWER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-07999

WATER QUALITY CONTROL BY ARTIFICIAL AERATION OF STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W75-08005

DIGITAL SIMULATION OF THE EFFECT OF THERMAL DISCHARGE ON STREAM WATER QUALITY,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
S. H. Lin, L. T. Fan, and C. L. Hwang.
Water Resources Bulletin, Vol 9, No 4, p 689-702, August 1973. 9 fig, 1 tab, 11 ref. OWRT-B-030-KAN(2).

Descriptors: *Water quality control, Streams, *Thermal pollution, *Simulation analysis, *Dissolved oxygen demand, Effects, Digital computers, Powerplants, Water temperature, Upstream, Downstream, Velocity, Equations, Systems analysis, Mathematical models.
Identifiers: *Streeter-Phelps model, Waste heat discharge, Energy balance equation, Method of characteristics, Heated cooling water, Heat loss.

A modified tansient version of the Streeter-Phelps model along with the energy balance equation is employed to analyze the effects of waste heat discharge from power plants on the concentration distributions of BOD and DO along a stream. Also examined are the effects of the upstream water quality and stream velocity on the downstream DO concentration level. The resulting coupled nonlinear hyperbolic partial differential equations representing the energy, BOD, and DO concentrations are solved by the method of characteristics and simulated on a digital computer. Results indicate that increased biochemical reaction rate and decreased reaeration and photosynthetic rates at a high temperature contribute significantly to the DO deficit. The upstream condition is an important factor in determining the allowable thermal discharge from a power plant. (Bell-Cornell)
W75-08006

A STUDY OF CONVECTIVE-DISPERSION EQUATION BY ISOPARAMETRIC FINITE ELEMENTS,
State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.
M-S. Wang, and R. T. Cheng.
Journal of Hydrology, Vol 24, No 1-2, p 45-56, January 1975. 9 fig, 20 ref. OWRT C-4026(No 9006)(3), 14-31-0001-9006.

Descriptors: *Path of pollutants, *Groundwater movement, *Convection, *Dispersion, *Mathematical models, Finite element analysis, Water pollution control, Mixing.
Identifiers: Convective-dispersion equation.

The transport of pollutants in groundwater aquifers was studied by means of a mathematical model. The governing equation for the movement of impurities takes the form of a convective-dispersion equation which is solved numerically using isoparametric, quadrilateral finite element method. The mixed boundary conditions and irregular distribution of the nodes can be handled easily by the finite element technique. The numerical model can be used as a means to predict the distribution of contaminants and to plan pollution control. (Knapp-USGS)
W75-08009

PHYTOPLANKTON CONCENTRATIONS IN THE MALAMOCCO CHANNEL OF THE LAGOON OF VENICE,
Istituto di Biologia del Mare, Venice (Italy).

For primary bibliographic entry see Field 5C.
W75-08063

CLEAN ENVIRONMENT FOR ULTRATRACE ANALYSIS,
Baker (J.T.) Chemical Co., Phillipsburg, N.J. Research Labs.
For primary bibliographic entry see Field 5A.
W75-08078

A PRELIMINARY APPROACH TO THE USE OF THE ISOTOPIC RATIO 13C/12C FOR THE EVALUATION OF MINERALIZATION IN AQUATIC ENVIRONMENTS,
Istituto Italiano di Idrobiologia, Pallanza.
R. Bertoni, U. Melchiorri-Santolini, R. Letolle, M. Lugrin, and P. Olive.
Int Rev Gesamten Hydrobiol, Vol 59, No 1, p 65-68, 1974.
Identifiers: Aquatic environment, Carbon-12, Carbon-13, *Isotopic carbon, Microbes, *Mineralization, *Traces, *Pelagic bacteria, *Bacteria, Organic matter.

The ratio 12C/13C is used as natural tracer for the estimation of the mineralizing acitivity of pelagic bacteria. Attention is particularly given to the variations of the isotopic ratio of the inorganic C produced by the microbial oxidation in comparison with ratio of the dissolved organic matter.--Copyright 1974, Biological Abstracts, Inc.
W75-08090

HEAD HAIR SAMPLES AS INDICATORS OF ENVIRONMENTAL POLLUTION,
University Coll., Cork (Ireland).
For primary bibliographic entry see Field 5A.
W75-08092

ON THE CHEMICAL MASS-BALANCE IN ESTUARIES,
Massachusetts Inst. of Tech., Cambridge, Mass. Dept. of Earth and Planetary Sciences.
E. Boyle, R. Collier, A. T. Dengler, J. M. Edmond, and A. C. Ng.
Geochemica et Cosmochimica Acta, Vol 38, p 1719-1728, 1974, 2 tab, 2 fig, 26 ref.

Descriptors: *Model studies, *Iron, *Heavy metals, *Estuaries, *Chemicals, Rivers, Riverflow, Silica, Reviews, River basin, Oceans, *Mixing, Dissolved solids, Salinity, Eddies, Sea water, Tributaries.
Identifiers: *Chemical mass-balance, Concentration gradients, Diffusion gradients, Sea salt, Diffusive flux, Coastal seawater.

A general model is presented for mixing processes between river and ocean water in which are established criteria for the identification of any non-conservative behavior of the dissolved constituents involved. A review of previous data shows that in no case has removal of silica been demonstrated unambiguously in estuarine regimes. New data for iron which show highly non-conservative behavior are used in an example of the application of the model. (Delfiner-Vanderbilt)
W75-08095

SOLUBILIZATION OF DIMETHYLMERCURY BY HALIDE IONS,
Missouri Univ., Rolla. Dept. of Chemistry.
L. E. Smith, and G. L. Bertrand.
Environmental Letters, Vol 4, p 273-279, 1973. 2 tab, 2 ref. OWRR A-045-MO(2).

Descriptors: *Mercury, *Solubility, Aqueous solutions, *Electrolytes, Organic compounds, Ions, Laboratory tests, Analytical techniques, Chemical reactions, Spectroscopy, *Pollutant identification.
Identifiers: *Methylmercury, *Atomic absorption analysis.

The solubility of dimethylmercury in water and aqueous electrolyte solutions at 25C was investigated with flameless atomic absorption analysis. Solubility was determined as the total concentration of all forms of mercury in an aqueous phase which results from prolonged contact with an excess amount of dimethylmercury. No attempt was made to differentiate between the various chemical states of mercury which might exist in the aqueous phase, nor to analyze the denser liquid phase composed primarily of dimethylmercury. The solubility in water (4 ppm) was generally decreased by addition of electrolyte, except in the case of halides, with which the solubility was greatly increased. (Jernigan-Vanderbilt)
W75-08096

RADIATION INDUCED THERMAL STRATIFICATION IN SURFACE LAYERS OF STAGNANT WATER,
Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
For primary bibliographic entry see Field 2H.
W75-08098

INTEGRATING CHEMICAL FACTORS WITH WATER AND SEDIMENT TRANSPORT FROM A WATERSHED,
Agricultural Research Service, Chickasha, Okla.
M. H. Frere.
Journal of Environmental Quality, Vol 4, No 2, p 12-17, Jan-Mar 1975. 3 fig, 3 tab, 18 ref.

Descriptors: *Mathematical models, *Water pollution sources, Sediment transport, Agricultural runoff, *Path of pollutants, Chemicals, Pesticides, Leaching, Soil erosion, Nutrients, Watershed management, Model studies.

A mathematical model that calculates the movement of a chemical as it is transported through or off of an agricultural watershed is described. Loss of the chemical between storms by degradation or volatilization is described by a first-order rate equation. Simple chromatographic theory is used to describe the chemical distribution in the soil during leaching, assuming a linear adsorption relation and dispersion that is proportional to the square root of the distance moved. The concentration at the surface during the storm is calculated to estimate the amounts lost in runoff water and with interrill erosion. It is assumed that rill erosion removes the chemical in proportion to the fraction of the area in rills and to the fraction of the chemical distribution in the soil intercepted by the rills. Mineralization and uptake are an additional source and sink for nitrate between storms. Lithium bromide movement on a microplot was used to examine some features of the model. (ARS)
W75-08099

RECREATION USES CHANGE MOGOLLON RIM ECONOMY,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station; and Arizona Univ., Tucson.
For primary bibliographic entry see Field 6B.
W75-08108

WATER POLLUTION BY TANNERY WASTES: THE POSSIBLE CAUSES OF MASS KILLING OF FISH AT MOSUL, IRAQ,
Mosul Univ. (Iraq). Dept. of Biology.
S. A. Rahim, A. N. Bhatnagar, A. N. Memon, and A. Alsarau.
Mesopotamia Journal of Agriculture, Vol 8, No 2, p 211-218, 1973. 3 tab, 1 map, 3 ref.

Descriptors: *Water pollution, *Fishkill, *Tannery wastes, Water pollution treatment, Water pollution sources, *Water pollution effects, Sulfur compounds, Dissolved solids, Killifishes, *Industrial wastes.
Identifiers: *Iraq, Orophon, Papain.

Tannery wastes discharged into the Tigris River near Mosul, Iraq, were determined to be the cause of a massive fish kill in the summer of 1972, following a team investigation into circumstances associated with the event. Analyses of water samples, sulfur compounds, dissolved oxygen, and toxic elements established that the sulfur compounds contributed most directly to the fishkill. In addition, the use of Orophon by the tanneries for treatment of animals skins may have been a factor, inasmuch as it has proved lethal on an experimental basis, although the exact nature of its physiological action is not known. The soluble sulphites appear to be the major cause, leading to a recommendation that the tanneries undertake certain chemical treatments to remove these substances which play such an important role in the depletion of dissolved oxygen. (Bowden-Arizona)
W75-08110

DENITRIFICATION IN LABORATORY SANDY COLUMNS,
Soil Conservation Service, Effingham, Ill.
L. A. Davenport, Jr., W. D. Lembke, and B. A. Jones, Jr.
Transactions of the ASAE American Society of Agricultural, Vol 18, No 1, p 95-105, January-February 1975. 8 fig, 2 tab, 12 ref. OWRT A-044-ILL(2).

Descriptors: *Denitrification, *Laboratory tests, *Soil water movement, *Groundwater, Water analysis, Chemical reactions, Nitrates, Model studies, Hydraulic models, Subsurface waters, Confined water, Tile drains, Nutrient removal. Moisture content.
Identifiers: Sand columns, *Substrate effects, *Methanol, Breakthrough curves, Gas production.

Nitrate was effectively reduced when methanol was added as a substrate material to a slowly moving solution in porous columns. Applied nitrate was removed at a rate of 87.4% during 24 days at 24C and 62% during 27 days at 13C. The use of sawdust as an oxidizable material had little effect upon nitrate removal. The flux was maintained at approximately 0.23 cm/hr. The production of gases which accompanied the denitrification process desaturated the methanol columns and influenced the flow rate. The breakthrough curves observed indicated that there may have been significantly different effective diffusion coefficient for nitrate as compared with chloride. The passage of nitrate and chloride through the columns was accompanied by an increase in redox potential and, in some cases, a discoloration of the effluent. The removal of a high percentage of nitrate at relatively large pore velocities was encouraging for the prospect of removing excess nitrate from soil water in the vicinity of tile drains. While a technique was not described, it could involve a system for water table control with additions of substrate material introduced by surface application or deep plowing. (Prickett-ISWS)
W75-08189

PREDICTING VERTICAL MOVEMENT OF MANURIAL NITROGEN IN SOIL,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
M. F. Walter, G. D. Bubenzer, and J. C. Converse.
Transactions of the American Society of Agricultural Engineers, Vol 18, No 1, p 100-105, January-February 1975. 10 fig, 4 tab, 14 ref. OWRT B-076-WIS(2).

Descriptors: *Farm wastes, *Soil water movement, *Nitrates, *Leachate, *Mathematical models, Water pollution sources, Feed lots, Groundwater, Denitrification, Soil temperature, Soil-water-plant relationships, Ammonium compounds, Equations, Solutes, Laboratory tests, Computer models, *Path of pollutants.
Identifiers: *Manure storage, Nitrate accumulation, *Nitrate transport, Solute movement.

A quantitative computer model to predict the vertical nitrate distribution in soil resulting from heavy land applications of anaerobic liquid dairy manure applied to a coarse textured soil was developed. The model predicted net nitrogen transformations to nitrate as a function of temperature. Nitrate movement was based on predicted one-dimensional unsaturated flow and solute dispersion. Dispersion was assumed dependent on solute displacement but not on soil water velocity. Parameters used in the model were developed for (1) soil with a deep water table, (2) soil temperatures of 0 to 20C, and (3) soil matric potentials of 0 to -0.3 bars. (Prickett-ISWS)
W75-08192

RUNOFF FROM AN INTERTIDAL MARSH DURING TIDAL EXPOSURE - RECESSION CURVES AND CHEMICAL CHARACTERISTICS,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
For primary bibliographic entry see Field 2L.
W75-08193

A GALERKIN-FINITE ELEMENT TECHNIQUE FOR CALCULATING THE TRANSIENT POSITION OF THE SALTWATER FRONT,
Princeton Univ., N.J. Dept. of Civil and Geological Engineering.
G. Segol, G. F. Pinder, and W. G. Gray.
Water Resources Research, Vol 11, No 2, p 343-347, April 1975. 7 fig, 13 ref. OWRT C-5224(No 4214)(1).

Descriptors: *Saline water intrusion, *Groundwater movement, *Finite element analysis, *Mathematical models, Simulation analysis, Mass transfer, Path of pollutants, Convection, Mixing.
Identifiers: *Galerkin method.

The set of nonlinear partial differential equations that describe the movement of the saltwater front in a coastal aquifer may be solved by the Galerkin-finite element method. Pressure and velocities are obtained simultaneously in order to guarantee continuity of velocities between elements. A layered aquifer may be modeled either with a functional representation of permeability or by a constant value of permeability over each element. (Knapp-USGS)
W75-08195

SEASONAL VARIATION IN SOME PHYSICAL, CHEMICAL, AND MICROBIOLOGICAL CHARACTERISTICS OF A SALINE AND A NON-SALINE SOIL NEAR ABU-GHRAIB, IRAQ,
Foundation of Scientific Research, Baghdad (Iraq).
For primary bibliographic entry see Field 2G.
W75-08199

THE CONTRIBUTION OF AGRICULTURE TO EUTROPHICATION OF SWISS WATERS: II. EFFECT OF FERTILIZATION AND SOIL USE ON THE AMOUNT OF NITROGEN AND PHOSPHOROUS IN THE WATER,
Eidgenoessische Forschungsanstalt fuer Agrikulturchemie, Bern.
For primary bibliographic entry see Field 5C.
W75-08200

THE BACTERIOLOGICAL CONDITIONS OF SOME BELGIAN BEACHES (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
Z. Dartevelle.
Bull Inst R Sci Nat Belg Biol. Vol 49, No 2, p 1-27, 1973, Illus.

Descriptors: Europe, *Beaches, *Water pollution, *Bacteria, Microorganisms, *Coliforms, E. coli, *Public health.
Identifiers: Salmonella-paratyphi, Shigella, *Belgium.

The contamination of certain Belgian beaches and of the Nieuwpoort Channel with coliforms and Escherichia coli was studied to determine the effects of the season of the year, tides, human or animal presence and effluent discharge on the contamination level. The mean concentration of coliform bacteria was significantly higher in summer than in the spring. High or low tide did not affect the concentration of bacteria, and the exposed beach zone occupied by vacationers was as polluted as the intertidal zone. The discharge of coliforms by sewers was considerable. The only pathogenic organism detected was Salmonella paratyphi B; Shigella was not identified in spite of the presence of shigaphages.--Copyright 1974, Biological Abstracts, Inc.
W75-08224

DETECTION OF SHIGELLA IN WATERS USING AN IMMUNOFLUORESCENCE TECHNIQUE AND THE IMMUNO-INDIA-INK REACTION (GECK REACTION), (IN FRENCH),
Institute of Hygiene and Epidemiology, Hanoi (North Vietnam).
For primary bibliographic entry see Field 5A.
W75-08244

METHEMOGLOBIN LEVELS IN INFANTS IN AN AREA WITH HIGH NITRATE WATER SUPPLY,
California State Dept. of Public Health, Sacramento.
For primary bibliographic entry see Field 5C.
W75-08256

BENTHIC DIATOMS AS INDICATORS OF MINING POLLUTION IN THE NORTH WEST MIRAMICHI RIVER SYSTEM, NEW BRUNSWICK, CANADA,
Fisheries Research Board of Canada, St. Andrews (New Brunswick). Biological Station.
W. K, Besch, M. Ricard, and R. Cantin.
Int Rev Gesamten Hydrobiol, Vol 57, No 1, p 39-74, 1972. Illus.
Identifiers: *Canada(Miramichi River NB), *Diatoms, Indicators, Mining pollution, Miramichi, *Acid mine wastes, *Benthos, *Bioindicators, Heavy metals.

Effects of acid heavy metal mining pollution on diatom communities from polyethylene and natural substrata were studied in a river system free of any other kind of pollution. a total of 169 species was recorded, many of them for the 1st time from the Atlantic provinces of Canada. Diatom communities were reliable indicators of the average pH. The presence of heavy metals is shown not by indicator species byt by the dominance of species of a corresponding tolerance with the simultaneous lack of less tolerant forms. A preliminary indicator system is proposed for this sort of pollution.--Copyright 1973, Biological Abstracts, Inc.
W75-08259

NEMATODES FOUND IN TAP WATER FROM DIFFERENT LOCALITIES IN PUERTO RICO,
Puerto Rico Univ., Rio Piedras. Dept. of Entomology.
J. Roman, and X. Rivas.
J Agric Univ PR, Vol 56, No 2, p 187-191, 1972.
Identifiers: *Nematodes, Plant parasites, *Puerto Rico, *Potable water, Water supply.

A total of 17 genera of known and suspected plant parasitic nematodes and 14 genera of free-living and particulate feeders were found in 12 localities. Presence of the nematodes presents a source of contamination for experiments and could interfere with nematological surveys.--Copyright 1973, Biological Abstracts, Inc.
W75-08260

COMMUNITIES OF OLIGOCHAETA AS INDICATORS OF THE WATER QUALITY IN LAKE HJALMAREN,
Uppsala Univ. (Sweden). Inst. of Zoology.
G. Milbrink.
Zoon, Vol 1, No 1, p 77-88, 1973. Illus.

Descriptors: Europe, Phytoplankton, Biomass, *Fish parasites, *Water pollution sources, *Water quality, Plankton, *Oligochaetes, *Tubificids, Benthic fauna, Lakes.
Identifiers: Abramis-brama, Caryophyllaeus-laticeps, Hjalmaren, Limnodrilus-hoffmeisteri, Oligochaeta, Potamothrix-hammoniensis, Psammoryctides-barbatus, *Sweden(Lake Hjalmaren).

Oligochaete material obtained from Lake Hjalmaren, Sweden 1966-67 was analyzed in detail and compared with other parameters measured during the same period. There is a close connection in the lake between the chemical-physical and the biological parameters all illustrate gradients of enrichment declining from W - E. High values of phytoplankton biomass does not seem to be followed by correspondingly high biomass values of the bottom fauna. The abundance of oligochaetes is extremely low throughout the lake. Predation might be an important factor. Caryophyllaeus laticeps is a parasite with tubificids as obligate intermediate hosts and bream, Abramis brama, as final host. The degree of infection of the bream was considerable, an indication that coarse fish feed quite extensively on tubificids in the lake. Potamothrix hammoniensis dominates the oligochaete fauna, 75-80% of all tubificids, except for the western basins, where Limnodrilus hoffmeisteri is most numerous as a consequence of pollution. Both species are very tolerant to pollution. Psammoryctides barbatus, which is rather sensitive to O2 deficiency, is important in the central and eastern basins comprising about 10% of all tubificids. The breeding cycles of the 3 tubificid species are briefly discussed. Indicator communities of oligochaetes in Lake Hjalmaren were compared with similar communities in Lake Malaren and Lake Vattern. A comparison was made on the species level between oligochaetes found in Lake Vattern by S. Ekman in 1911-1914 and material obtained in 1966-68 and 1969 by Grimas. Apart from some minor differences the same species dominated the oligochaete communities in 1911 as they do today.--Copyright 1974, Biological Abstracts, Inc.
W75-08267

TRACE METAL LEVELS IN THREE SUBTIDAL INVERTEBRATES,
Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.
S. R. Schwimer.
Veliger, Vol 16, No 1, p 95-102, 1973, Illus.
Identifiers: *California(Monterey Bay), *Invertebrates, *Metals, Olivella-biplicata, Pisaster-brevispinus, Polinices-lewisii, Sub-tidal, *Trace elements, Water pollution sources.

Determination of Ag, Al, Ba, Ca, Cd, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sr, and Zn levels were measured by atomic absorption spectroscopy in the gastropods Polinices lewisii and Olivella biplicata, and in the echinoderm Pisaster brevispinus. The animals were sampled from 3 environmentally different sandy beaches of the Monterey Bay in California: Elkhorn Slough, Moss Landing; Monterey Sewage Outfall, Monterey; and Fisherman's Wharf, Monterey. Results indicate no magnification of heavy metals through the trophic levels studied. However, much variability of metal concentrations within the same species existed when compared on a geographical basis. Cu and Pb values were highest at Fisherman's Wharf; Ag, Cd and Zn values were elevated at the Monterey

Sewage Outfall, and Elkhorn Slough had high Fe values. Concentrations of the heavy and trace metals studied suggest possible consequences of pollution into the Monterey Bay.--Copyright 1973, Biological Abstracts, Inc.
W75-08276

MODELING DYNAMICS OF BIOLOGICAL AND CHEMICAL COMPONENTS OF AQUATIC ECOSYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W75-08279

RICHARD B. RUSSELL LAKE WATER QUALITY INVESTIGATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.
W75-08293

A BACTERIOLOGICAL SURVEY OF THE LITTLE RIVER, SOUTH CAROLINA- CALABASH CREEK, NORTH CAROLINA AREA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-227 921, $4.75 in paper copy, $2.25 in microfiche. November 1972. 97 p, 9 tab, 15 fig, 11 ref.

Descriptors: *Public health, *Coliforms, *Water quality, *Water quality control, Domestic wastes, Waste treatment, Environmental engineering, Recreation, Waste water(Pollution), *North Carolina, *South Carolina.
Identifiers: Little River(South Carolina), Calabash Creek(North Carolina), *Intracoastal Waterway.

Field investigations were conducted to determine the bacterial quality of portions of the Intracoastal Waterway, Calabash Creek and major waste sources discharging into these waters. Findings indicate that development within the study area has created demands on the existing municipal waste collection and treatment systems that exceed the capacities of these systems. In many cases bacterial standards were violated, sometimes constituting a health risk. Recommendations for achieving full growth potential with minimal damages to environmental waters are presented. (Katz)
W75-08302

WATER QUALITY AND WASTE SOURCE INVESTIGATIONS. MISSOURI RIVER AND KANSAS RIVER, KANSAS CITY, KANSAS.
Environmental Protection Agency, Kansas City, Mo. Region VII.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-227 987, $8.50 in paper copy, $2.25 in microfiche. April 1973, 280 p, 41 tab, 8 fig, 15 ref.

Descriptors: *Water quality control, *Water pollution sources, *Water quality standards, Water pollution treatment, Pollutants, *Industrial wastes, *Waste treatment, Water resources, *Heavy metals, *Missouri River, *Domestic wastes, Biota, Dissolved oxygen, Tribudity, Salmonella, Kansas.
Identifiers: *Kansas River(Kansas).

A complete survey of the bacterial densities, biota, waste-treatment plants and water quality of the lower 10 miles of the Kansas River and the Missouri River from upstream of the confluence with the Kansas River was conducted. Violations of many water quality standards were found in dissolved oxygen, pretreatment of toxic materials, discharge of heavey metals, and treatment of industrial wastes. Recommendations to eliminate health dangers are presented; they include secondary-treatment effluent limitations, bacterial density guidelines, pretreatment regulations for industry, control of heavy metal pollution and control of oil, grease and phenols discharged to the Missouri River. (Katz)
W75-08307

ICHTHYOFAUNA OF THE TYSMIENICA AND WLODAWKA RIVER BASINS, (IN POLISH),
Akademia Wychowania Fizycznego, Warsaw (Poland). Zaklad Nauk Biomedycznej.
For primary bibliographic entry see Field 2H.
W75-08310

SOME ENZYME AND RESPIRATORY ACTIVITIES OF TROPICAL SOILS FROM NEW HERBRIDES,
Department of Scientific and Industrial Research, Lower Hutt (New Zealand). Soil Bureau.
For primary bibliographic entry see Field 2G.
W75-08316

MOVEMENT AND PERSISTENCE OF BENSULIDE AND TRIFLURALIN IN IRRIGATED SOIL,
Agricultural Research Service, Weslaco, Tex. Lower Rio Grande Valley Research and Extension Center.
R. M. Menges, and S. Tamez.
Weed Sci, Vol 22, No 1, p 67-71, 1974, Illus.

Descriptors: *Irrigated soil, *Pesticide kinetics, Herbicides, Sorghum, *Path of pollutants.
Identifiers: *Bensulide, *Trifluralin.

Bensulide (0,0-diisopropyl phosphorodithioate S-ester with N-(2-mercaptoethyl)benzenesulfonamide) and trifluralin (a,a,a-trifluoro-2,6-dinitro-N,N-dipropyl-p-toluidine) were incorporated to a depth of 2.5 and 7.5 cm in sandy loam soil on the same plots in 3 annual applications to study the effect of incorporation depth on movement and persistence of the herbicides in furrow-irrigated soil. Bioassays and gas-liquid chromatographic assays indicated that, regardless of rainfall, both herbicides remained within the original soil zones of incorporation. Trifluralin persisted longer in soil as depth of incorporation was increased. Neither bensulide at 4.5 or 9.0 kg/ha nor trifluralin at 1.1 kg/ha persisted in appreciable amounts of 12 mo. after treatment. At these rates, significant residues of bensulide and trifluralin were detected after 6 mo. only when tillage was restricted. Herbicide concentrations that persisted 6 mo. as determined in laboratory assays caused severe reduction in growth of field-grown sorghum (Sorghum bicolor (L.) Moench).--Copyright 1974, Biological Abstracts, Inc.
W75-08318

THE BREACH IN THE FLOW OF MINERAL NUTRIENTS,
G. Borgstrom.
Ambio, Vol 2, No 5, p 129-135, 1973, Illus.

Descriptors: *Ecosystems, *Urbanization, Effects, Fertilizers, *Nutrients, *Minerals, Sewage effluents, Water pollution, Nitrogen, Phosphates, Industrial effluents, Waste disposal, Waste water disposal.

The urban ecosystem is analyzed as affected by the increasing urban congestion. Attention is focused on 1 key feature, the breach in the cycling of mineral nutrients via food. As no device was adequate to bridge this gap the fertilizer industry became the logical response. No corresponding countermeasure has been taken to tackle the sewage accumulation with the concomitant water pollution, which is further aggravated by this repeat fertilizing. Compounding this effect is: the increasing outtake of water, reducing the volume of lakes, rivers and similar recipients; and the separation of plant and animal production (accumulation of manure). Factors that have been instrumental in making the N and phosphate loads excessive are discussed. City sewage and waste disposal system for food and pulp factories urgently need to be transformed into food and feed raising centers, supplementary to conventional agriculture and fisheries.--Copyright 1974, Biological Abstracts, Inc.
W75-08319

URBANIZATION AND THE MICROBIAL CONTENT OF THE NORTH SASKATCHEWAN RIVER,
Alberta Univ., Edmonton. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W75-08329

RETENTIOS AND RELEASE OF PHOSPHORUS IN CERTAIN CALCAREOUS SOILS OF THE U.A.R. (UNITED ARAB REPUBLIC): I. THE INFLUENCE OF INCUBATION PROCESS AND CYCLES OF WETTING AND DRYING,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
A. H. El-Damaty, A. E. E-Leboudi, and H. Hamdi.
U A R J Soil Sci. Vol 11, No 1, p 89-97, 1971, Illus.

Descriptors: *Calcareous soils, *Phosphorus, Soils, *Soil chemical properties, *Soil physical properties, *Alluvial soils, Wetting, Drying.
Identifiers: *United Arab Republic, Wetting-drying cycles.

Available P was found to decrease, opposite to its retention percentage, with the increase of either the period of incubation or the number of wetting and drying cycles in the soil. However, wetting and drying processes had a more pronounced effect than that of incubation, soils of alluvial nature being more affected than those of calcareous origin. Values representing the percentages of retention within the soil samples were lower, opposite to those of available P, as the amounts of applied phosphates were higher.--Copyright 1973, Biological Abstracts, Inc.
W75-08350

5C. Effects Of Pollution

FATE AND EFFECTS OF TRACE ELEMENTS IN SEWAGE SLUDGE WHEN APPLIED TO AGRICULTURAL LANDS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-07852

EFFECTS OF SEA WATER EXTRACTS OF SEDIMENTS FROM CHARLESTON HARBOR, S.C., ON LARVAL ESTUARINE FISHES,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
D. E. Hoss, L. C. Coston, and W. E. Schaaf.
Estuarine and Coastal Marine Science, Vol 2, No 4, p 323-328, October 1974. 1 fig, 4 tab, 14 ref. Army Contract DACW60-71-C-0011.

Descriptors: *Sediments, *Water pollution effects, *Fishkill, Laboratory tests, Estuaries, Dredging, Spoil banks, Waste disposal, Mortality, Fish toxins, Larvae, Larval growth stage, Estuarine environment, Estuarine fisheries, *South Carolina.
Identifiers: Charleston Harbon(SC), Cooper River(SC).

Larvae of seven species of estuarine fishes (Atlantic menhaden, Brevoortia tyrranus; pinfish, Lagodon rhomboides; flounder, Paralichthys dentatus, P. albigutta, P. lethostigma; spot, Leiostomus xanthurus; and Atlantic croaker, Micropogon undulatus) were exposed to sea water extracts of sediments from Charleston Harbor, South Carolina, for periods of time up to 14 days. Survival of the larvae in various concentrations of

the extracts was measured. Survival of the larvae was affected at the highest concentrations of extract tested and indications are that different species of fish have different survival rates. In the selection of disposal areas for dredged material, consideration should be given to its relative toxicity to organisms. (Sims-ISWS)
W75-07893

A METHOD FOR THE STEPWISE ENRICHMENT FOR THE DEMONSTRATION OF SALMONELLA IN FRESH AND SALT WATER, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W75-07928

CONTRIBUTIONS TO THE STUDY OF THE ALGAL FLORA OF ALGERIA. III. HYDROBIOLOGY OF CHOTT EL HODNA: AUTOECOLOGY OF THE DIATOMS,
Algiers Univ. (Algeria). Laboratoire de Botanique.
R. Baudrimont.
Bull Soc Hist Nat Afr Nord, Vol 62, No 3/4, p 39-49, 1971, Illus.
Identifiers: Algal flora, *Algeria(Chott el Hodna), Carbonates, Chlorides, *Diatoms, Ecology, Hydrobiology, *Sulfates, *Artesian wells, *Alkalinity, Bicarbonates, Halobios, Anions.

Artesian well waters of the western zone of Chott et Hodna are alkaline, beta-mesohaline, rich in sulfates and bicarbonates and low in chlorides. A study of the diatoms has resulted in a characterization of species associated with these different anions, and a definition of their position in the halobios. (See also W73-10399)--Copyright 1973, Biological Abstracts, Inc.
W75-07936

CLADOPHORA DISTRIBUTION IN LAKE ONTARIO (IFYGL),
Environmental Research Inst. of Michigan, Ann Arbor.
C. T. Wezernak, D. R. Lyzenga, and F. C. Polcyn.
Available from the National Technical Information Service, Springfield Va. 22161, as PB-240 307, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Grosse Ile, Michigan, Report EPA-660/3-74-028, December 1974. 76 p, 54 fig, 8 tab, 5 ref. 1B1026, 800778.

Descriptors: *Cladophora, *Distribution, Lakes, *Remote sensing, Great Lakes, *Lake Ontario, Standing crops, Eutrophication, Growth rates, Temperature, Thermal pollution, Water pollution effects.

Multispectral remote sensing data were collected along the U.S. shoreline of Lake Ontario, under the sponsorship of the Environmental Protection Agency, as part of the International Field Year on the Great Lakes (IFYGL) program in Lake Ontario. Data were processed to show the distribution of Cladophora in the nearshore zone and to estimate the standing crop. Additionally, thermal data in the study area were displayed. The results show an extensive growth and development of Cladophora in the study area. Approximately 66% of the nearshore zone in the western portion of the lake and 79% in the eastern portion is covered by Cladophora. Several major and minor thermal features and thermal discharges were evident at several locations along the U.S. shoreline. (EPA)
W75-07968

MICROBIAL DEGRADATION AND ACCUMULATION OF PESTICIDES IN AQUATIC SYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W75-07970

EFFECTS OF MIREX AND HMETHOXYCHLOR ON STRIPED MULLET, MUGIL CEPHALUS L.,
Oceanic Inst., Waimanalo, Hawaii.
J. H. Lee, C. E. Nash, and J. R. Sylvester.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 635, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Gulf Breeze, Florida, Report EPA-660/3-75-015, May 1975. 18 p, 10 tab, 29 ref. OI-120. 1EA077. R802348.

Descriptors: *Chlorinated hydrocarbon pesticides, Mortality, Pesticide toxicity, Bioassay, Pesticide residues, Water pollution effects, Fish, *Mullets Fiskill, Fish eggs, Pollutant identification.
Identifiers: *Mirex, *Methoxychlor, Larval survival(Mullet), Striped mullet.

The effects of two chlorinated insecticides, mirex and methoxychlor, on striped mullet, Mugil cephalus L., were studied. Test concentrations of both insecticides used were 0.01, 0.1, 1.0 and 10.0 ppm in dynamic bioassay. Young juveniles were more susceptible to mirex exposure than older juveniles or adults. No mortalities occurred in older juveniles and adults exposed to mirex for 96 hours. For young juveniles, mortalities were highest in concentrations of 0.1 and 1.0 ppm and were less in concentrations of 0.01 and 10.0 ppm. Significant amounts of mirex residues were accumulated in the body tissues of the test fish; concentrations increased with increased environmental concentrations. Methoxychlor was more toxic to mullet than mirex. Mortalities were greater than 90 percent over a 96-hour period for all life stages studied at concentrations of 0.1, 1.0 and 10.0 ppm. Mortality at a concentration of 0.01 was 5.1 percent or less for 96 hours. Relative to mirex, small amounts of methoxychlor residues accumulated in the tissues of the test fish. Results of the experiments on eggs and larvae were inconclusive. Egg survival was slightly better in mirex than in methoxychlor over a 96-hour period. Larval survival was generally better in mirex than methoxychlor. (EPA)
W75-07973

DEVELOPING BIOLOGICAL INFORMATION SYSTEMS FOR WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-08002

DIGITAL SIMULATION OF THE EFFECT OF THERMAL DISCHARGE ON STREAM WATER QUALITY,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-08006

PHYTOPLANKTON CONCENTRATIONS IN THE MALAMOCCO CHANNEL OF THE LAGOON OF VENICE,
Istituto di Biologia del Mare, Venice (Italy).
D. Voltolina.
Arch Oceanogr Limnol. Vol 18, No 1, p 1-18, 1973, Illus.
Identifiers: Channels, *Diatoms, *Flagellates, *Italy(Lagoon of Venice), Lagoons, Microorganisms, Peridinians, *Phytoplankton, Seasons, Estuaries.

The phytoplanktological data of a research program carried out in the central basin of the lagoon of Venice (Italy) are presented. The data collected during a yearly period of observations show that the phytoplankton populations of lagoonar origin are not, on average, quantitatively different from those coming from the sea, being distinguishable only from a qualitative point of view. Diatoms and micro-flagellates are in general the main constituents of the plankton populations, while only during short periods are peridinians concentrations quantitatively significant.--Copyright 1974, Biological Abstracts, Inc.
W75-08063

LEVELS OF COPPER, NICKEL, RUBIDIUM, AND STRONTIUM IN INSTITUTIONAL TOTAL DIETS,
Food and Drug Administration, Cincinnati, Ohio.
For primary bibliographic entry see Field 5A.
W75-08075

MEDICAL ASPECTS OF CHILDHOOD LEAD POISONING.
For primary bibliographic entry see Field 5G.
W75-08077

REGULATION OF REPRESSIBLE ALKALINE PHOSPHATASE BY ORGANIC ACIDS AND METAL IONS IN NEUROSPORA CRASSA,
Illinois Univ., Urbana. Dept. of Botany.
M. L. Hochberg, and M. L. Sargent.
Canadian Journal of Microbiology, Vol 19, No 12, p 1487-1492, December, 1973. 6 fig, 1 tab, 28 ref.

Descriptors: *Microbiology, *Fungi, *Enzymes, *Metals, *Inhibitors, Acids, Organic compounds, Alkalinity, Cultures, Iron, Zinc, Copper, Electrophoresis, Ions.
Identifiers: *Neurospora crassa.

Various organic acids used in standing cultures of Neurospora regulate the specific activity of mycelial, repressible alkaline phosphatase. The regulatory control occurs primarily through chelation of metal ions which are necessary for the production or stability of the enzyme. Both iron and zinc were needed in the growth medium to produce a maximum enzyme level, while a high copper concentration depressed the enzyme level. Electrophoresis of mycelial extracts on gradient polyacrylamide gels demonstrated that the organic acids and iron do not have these regulatory effects on the repressible or constitutive acid phosphatases of Neurospora. (Jernigan-Vanderbilt)
W75-08084

OXIDATION OF METAL SULFIDES BY THIOBACILLUS FERRO-OXIDANS GROWN ON DIFFERENT SUBSTRATES,
Laval Univ., Quebec. Department of Biochimie.
M. Silver, and A. E. Torma.
Canadian Journal of Microbiology, Volume 20, No 2, p 141-147, February, 1974. 1 fig, 2 tab, 15 ref. NRCC(NRCC-A6504).

Descriptors: *Oxidation, *Bacteria, *Sulfides, *Iron, *Pyrite, Solubility, Nickel, Inorganic compounds, Zinc, Copper, Lead, Cobalt, Cadmium, Mercury, Laboratory tests, Cultures, Analytical techniques, Spectroscopy, Instrumentation, Pollutant identification.

The effects of the substrate, on the oxidation of a number of metal sulfides, and the ability of autrophic bacteria to use the energy thus obtained to support CO2 assimilation were studied. Thiobacillus ferroxidans, grown on either ferrous sulfate, lead sulfide concentrate, or chalcopyrite concentrate demonstrated oxygen uptake and CO2 fixation in the presence of ferrous sulfate, chalcopyrite ore, pyrite ore, and red antimony trisulfide. Lead sulfide-grown cells could oxidize lead sulfide ore and galena using the energy obtained from CO2 fixation. All three types could oxidize nickel sulfide, but could not fix CO2 in the presence of this substrate. The solubilization of metals from the substrate and the crystallographic changes in the insoluble residues were also reported. (Jernigan-Vanderbilt)
W75-08085

THE EFFECT OF SILVER IONS ON THE RESPIRATORY CHAIN OF ESCHERICHIA COLI,
British Columbia Univ., Vancouver. Dept. of Biochemistry.
P. D. Bragg, and D. J. Rainnie.
Canadian Journal of Microbiology, Volume 20, No 6, p 883-889, June 1974. 6 fig, 17 ref.

Descriptors: *Silver, *Respiration, *Microorganisms, *Inhibitors, Microbiology, Cytological studies, Chromosomes, Laboratory tests, Cultures, Ions, Metabolism, Water pollution effects, *E. coli, Pollutant identification.

Silver ions inhibited the oxidation of glucose, clycerol, fumarate, succinate, D- and L-lactate, and endogenous substrates by intact cell suspensions of Escherichia coli. Silver ions reacted with the respiratory chain at two levels. The site most sensitive to inhibition was located between the b-cytochromes and cytochrome a sub 2. The second level of inhibition was in the NADH and succinate dehydrogenase regions of the respiratory chain, and was situated on the substrate side of the flavin components. (Jernigan-Vanderbilt)
W75-08086

EFFECTS OF POLLUTANTS ON MARINE LIFE PROBED.
Chemical and Engineering News, Vol 51, No 51, p 17, 18, 23, December, 1973, 1 fig, 1 photo.

Descriptors: Water pollution, *Oceans, *Plankton, *Pesticide toxicity, *Oil wastes, On-site investigations, Testing procedures, Marine life, *Heavy metals, Copper, Mercury, *Canada, *Water pollution effects, Lethal limit.
Identifiers: Vancouver, B.C., Sublethal effects.

An international team of scientistis from seven institutions began attacking the problem of the effects of low concentrations of pollutants on the marine environment. In a Controlled Ecosystem Pollution Experiment (CEPEX) sponsored by the National Science Foundation, scientists from the U.S, Canada, and the United Kingdom were attempting to determine the long-term effects on natural marine ecosystems of low levels of three types of chemical pollutants: heavy metals, certain synthetic hydrocarbons, and petroleum hydrocarbons. In particular, they were examining the sublethal effects of pollution on the stability of plankton communities. The key to the CEPEX effort is the establishment of a large-scale but controlled replica of the natural environment. This will be accomplished by using a system of large plastic cylinders, 10 meters in diameter and 30 meters in height, that will be closed at the bottom, open to the atmosphere at the top, and suspended in the natural ocean environment of Vancouver Island, BC. They will enclose about 2400 cubic meters of sea water including the natural plant and animal populations. (Jernigan-Vanderbilt)
W75-08097

SEASONAL CHANGES IN THE BIOMASS OF THE MACRO-BENTHOS OF A TIDAL FLAT AREA IN THE DUTCH WADDEN SEA,
Nederlands Instituut voor Onderzoek der Zee, Texel.
J. J. Beukema.
Neth J Sea Res, Vol 8, No 1, p 94-107, 1974. Illus.
Identifiers: Arenicola-marina, *Benthos, *Biomass, Birds, Fish, Food, Growth rates, Mya-arenaria, Seas, *Seasonal, Shellfish, Tidal, *Netherlands(Wadden Sea).

Macrofauna benthos has been sampled frequently during 6 yr at 3 intertidal stations on a tidal flat area in the westernmost part of the Wadden Sea. Biomass, expressed as ash-free dry weight, fluctuated with a regular annual pattern. Maximal amounts were observed every year at each station during the July-Sept. periods, minimal amounts during the Dec.-March periods. The steep increases during spring were for the greater part due to fast growth of animals already present in winter. Spat fall generally contributed only a minor part to the annual biomass increases. The declines during autumn were attributable both to decreases in numbers and to individual weight losses. The latter dominated in the big and deep-living specimen of 2 spp. (Mya arenaria and Arenicola marina) which comprised about half of the total biomass of the benthos. Among the predators feeding on the benthos at the tidal flats, fish, just as the shellfish, are most numerous during summer, but monthly numbers of birds are unrelated to seasonal changes in availability of food.--Copyright 1974, Biological Abstracts, Inc.
W75-08103

SILICON DEPLETIONS IN SOME NORFOLK RIVERS,
Yorkshire River Authority, Leeds (England). Pollution Prevention Dept.
A. M. C. Edwards.
Freshwater Biol, Vol 4, No 3, p 267-274, 1974. Illus.
Identifiers: Depletions, *Diatoms, *Magnesium, Productivity, Rivers, Seasonal, *Silicon depletion, *United Kingdom(Norfolk rivers), *Dissolved solids.

Water samples collected weekly from the rivers Yare, Tud, Wensum and Tas in Norfolk, England, displayed marked depletions in the spring and summer of the concentration of dissolved silicon. These were unconnected with any hydrological event and were assumed to be due to the assimilation of silicon by diatoms. Equilibrium concentrations were maintained in the Yare and Tud during the weeks prior to and following the spring bloom. It was estimated that 35 Mg (51%) of the predicted load were removed from the Yare during the 11 wk of this depletion and 6.0 Mg (45%) from the Tud. The lowest observed concentration (0.4 mg/1) occurred during the 1st week in May when over 90% of the silicon had been removed. However, the maximum amount of removal and hence maximum diatom productivity occurred earlier at a time of higher water discharge. A similar pattern was observed in the Yare during the spring of 1971. Two small blooms occurred later in the summer of 1970 in the Yare and Tud. It was estimated that 15% of the Yare's dissolved silicon load of 263 Mg was in the assimilated form and 12.5% of the Tud's output of 56.6 Mg. The weathering of silicate minerals was probably the source of almost all the silicon and the outputs represented a silicon erosion rate of 1.15 Mg/km2/yr for the Yare and 0.77 Mg/km2/yr for the Tud.--Copyright 1974, Biological Abstracts, Inc.
W75-08106

INVESTIGATIONS ON THE TOXICITY OF SEAWATER-EXTRACTS OF THREE CRUDE OILS ON EGGS OF COD (GADUS MORHUA),
Kiel Univ. (West Germany). Institut fuer Meereskunde.
W. W. Kuehnbold.
Ber Dtsch Wiss Komm Meeresforsch, Vol 23, No 2, p 165-180, 1974.
Identifiers: Abnormalities, *Cod eggs, *Crude oil, *Embryonic stages, Gadus-morrhua, Gastrulation, Hatching, Larvae, Sea water, *Toxicity, Water pollution effects, *Oil wastes, Oil pollution, Fish eggs.

The influence of the water-soluble fractions of 3 crude oils (Tia Juana/Venezuela, Agha Jari/Iran, Sarir/Libya) upon embryogenesis was studied. At continuous and at short term influence the crude oils exerted different rates of mortality. The water-soluble fraction was extracted from 2.5, 25 and 250 ml of oil using 25 l seawater under slow stirring, resulting in concentrations of 0.015-3.5 ppm of total-hydrocarbon. The 48 LC50 and 96 LC50 were in the order of 1-12 ppm. The retarding effect of the Iran extract during development was particularly obvious during gastrulation and before hatching. The broadest spectrum of embryonic abnormalities was found after the gastrula stage. The rate of distorted, non-viable larvae was high in certain experiments after treatment of eggs with crude oils.--Copyright 1974, Biological Abstracts, Inc.
W75-08107

WATER POLLUTION BY TANNERY WASTES: THE POSSIBLE CAUSES OF MASS KILLING OF FISH AT MOSUL, IRAQ,
Mosul Univ. (Iraq). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W75-08110

GJERSJOEN--A EUTROPHIC LAKE IN NORWAY,
H. Holtan.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 349-354, 1972. 3 fig, 2 tab, 8 ref.

Descriptors: *Eutrophication, *Lakes, Water pollution effects, Anaerobic conditions, Agricultural runoff, Dissolved oxygen, Nutrients, Organic matter, Stratification, Cyanophyta, Diatoms, Chlorophyta, Sewage effluents, Industrial wastes, Oxidation-reduction potential, Europe, Conductivity, Physicochemical properties, Primary productivity, Dystrophy.
Identifiers: *Lake Gjersjoen(Norway).

Eutrophication of Lake Gjersjoen is an example of destruction of lakes receiving wastes. About 19% of its drainage area is agricultural land. Untreated or mechanically-treated sewage from the population is discharged into the lake or its tributaries. Oxygen consumption, normal for dystrophic lakes, was clearly perceptible in the deeper layers during stratification periods. Since 1960, waste discharged into Lake Gjersjoen has doubled resulting in a markedly eutrophic state. In the fall of 1964, water blooms of blue-green algae suddenly developed and have been steadily increasing. Corresponding to changes in biological conditions is the marked change in chemical composition. Shortly after the spring circulation period, a heavy diatom population develops; later the green and blue-green algae dominate. The accelerating eutrophic development in this lake during the last decade is due to use of the lake as a recipient for sewage and industrial wastes. In this connection, it is important to remember that the lake in its original state contained a heavy concentration of allochthonous organic material; also that dystrophic lakes are unsuitable as recipients of polluted water. (Jones-Wisconsin)
W75-08119

SEASONAL VARIATION OF NITROGEN, PHOSPHORUS, AND CHLOROPHYLL A IN LAKE MICHIGAN AND GREEN BAY, 1965,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
H. E. Allen.
Technical Papers 70, June 1973 (Contribution 471 of the Great Lakes Fishery Laboratory). 23 p, 10 fig, 9 tab, 16 ref.

Descriptors: *Nitrogen, *Phosphorus, *Chlorophyll, *Lake Michigan, Seasonal, Nutrients, Michigan, Wisconsin, Phosphates, Nitrates, Eutrophication, Aphotic zone, Euphotic zone, Littoral.
Identifiers: *Green Bay(Wis).

Phosphorus and nitrate content of Lake Michigan and its relation to phytoplankton abundance were determined. The data help to establish a base for evaluation of future changes in nutrient content. Total and dissolved phosphorus, nitrate, and chlorophyll-a were measured at four stations (inshore Michigan, offshore Michigan, offshore Wisconsin, and inshore Wisconsin) and one station in southern Green Bay. Nutrients were measured at 2,- 5,- and 10-meter depths and

chlorophyll-a at 2 meters. In Green Bay total phosphorus was about five times as high and dissolved phosphorus more than twice as high as the averages for the four Lake Michigan stations, but nitrate nitrogen concentration was only about one-third that in the lake. Total and dissolved phosphorus were about 50% higher in the inshore Lake Michigan area than in the other three. Concentration and seasonal trends in nitrates differed relatively little among the stations. Nitrate at all areas and depths sampled decreased to almost nondectable levels during September. Chlorophyll-a was 70% higher at the two inshore stations than at the two offshore areas and was more than four times higher in Green Bay than any other portion of lake. (Jones-Wisconsin)
W75-08120

NITROGEN CYCLE AND BLUE-GREEN ALGAE (2),
H. L. Golterman.
H2O, Tijdschrift voor Watervoorziening en Afvalwaterbehandeling, Vol 7, No 8, p 152-155, 1974. 2 fig, 77 ref.

Descriptors: *Nitrogen cycle, *Cyanophyta, Plant physiology, Nitrogen fixation, Eutrophication, Light intensity, Migration, Algal toxins, Nitrification.
Identifiers: Light inhibition.

In addition to the N-fixing abilities of blue-green algae several other physiological differences between them and other algal groups may separately or jointly be the cause of the 'bloom' phenomenon. They can grow in dim light which allows them to inhabit two completely different niches of the lake. Various species of blue-green algae contain gas vacuoles; by varying their number the algae are able to migrate between suitable light conditions and the dark, more nutrient-rich layers. Some blue-green algae often occur simultaneously with high concentrations of organic matter, often organic pollutants. The question of whether or not toxin production by blue-green algae does stimulate their blooms under natural conditions is still open to doubt. There is no evidence that the blue-green algal cells have a lower than average N or P content. A nitrogen cycle can be composed in a similar form to that for the summary of the phosphate process (Golterman 1973). Analysis of the nitrification phenomenon can be carried out using a generalized steady state multidimensional feedback model. (Jones-Wisconsin)
W75-08121

ANALYSES OF PHOSPHORUS IN LAKE ONTARIO SEDIMENT,
State Univ. Coll., Buffalo, N.Y. Great Lakes Lab.
R. K. Wyeth.
International Association Great Lakes Research, Proceedings 16th Conference on Great Lakes Research, p 345-348, 1973. 4 tab, 10 ref.

Descriptors: *Analytical techniques, *Phosphorus, *Lake Ontario, *Lake sediments, Technology.
Identifiers: Ascorbic acid.

Since phosphorus is an element of major importance to the growth of aquatic organisms, it is essential to have precise and accurate methods to determine its concentrates. In an attempt to ascertain a rapid reproducible and accurate method for determining the phosphorus content in sediment from the Great Lakes, two methods of digestion were examined, persulfate and nitric acid-sulfuric acid. The sediment was collected from Lake Ontario during the spring and summer of 1972. Phosphorus analyses on the digested samples were made according to vandomolybophosphoric acid colorometry, stanous chloride and two variations of the ascorbic acid method, combined reagent and combined reagent plus alcohol. The data presented were statistically analyzed. The ascorbic acid method using combined reagent and alcohol following nitric acid-sulfuric acid digestion yielded the most accurate results, 92-96% recovery, as determined by the use of spiked and split dilution samples, and the least deviation (less than 0.010-0.017) at concentration between 0.35 and 1.67 mg P/g. The nitric acid-sulfuric acid digestion procedure is very rigorous, where the sediment is boiling in the concentrated acid mixture for up to 24 hours. Despite this time period, many samples can be digested simultaneously. (Jones-Wisconsin)
W75-08122

THE CONDITION OF LAKES AND PONDS IN RELATION TO THE CARRYING OUT OF TREATMENT MEASURES,
Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.
P. J. Laurent, J. Garaucher, and P. Vivier.
In: Advances in Water Pollution Research, Pergamon Press, Oxford and New York, 1972, p III-23/1-III-23/10. 6 fig, 3 tab, 11 ref.

Descriptors: *Lakes, *Pollution abatement, Waste water treatment, Physicochemical properties, Dissolved oxygen, Phytoplankton, Eutrophication, Sewerage, Lake sediments, Europe.
Identifiers: Lake Leman(France), Lake Annecy(France), Lake of Nantua(France).

Some aspects of pollution and associated eutrophication occurring in the three largest freshwater lakes in eastern France and remedial measures are described. Studies were commenced on Lake Leman in 1957 and on Lake Annecy in 1966. Wastewater treatment programs have been applied either before or simultaneously with the investigations. Results show response to remedial measures and permit an initial judgment of their efficacy. Considered as 'becoming eutrophic' in 1937, Lake Annecy after construction of part of the peripheral sewer and discharge of treated sewage effluent downstream seems to have stopped its eutrophication trend. Lake Leman, despite installation of mechanical and biological wastewater treatment plants similar to those at Lake Annecy, has, since 1937, undergone an unfavorable chemical and biological evolution. The Lake of Nantua is known for its advanced state of eutrophication. It seems that the only appropriate remedy lies in diverting all wastewater contributions from the lake and discharging these downstream. This remedial action is being carried out. Because of the combined sewerage in the Town of Nantua, a storm overflow will have to be installed at the head of the main diverting canalization. (Jones-Wisconsin)
W75-08123

ECOSYSTEM STUDIES IN CONNECTION WITH THE RESTORATION OF LAKES,
S. Bjork.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 379-387, 1972. 7 fig, 2 tab, 6 ref.

Descriptors: *Pollution abatement, *Lakes, Eutrophication, Shallow water, Submerged plants, Water pollution effects, Waterfowl, Lake sediments, Phosphorus, Dredging, Phosphates, Nitrates, Nutrients, Hydrogen ion concentration, Phytoplankton, Primary productivity, Sedimentation, Detritus, Plant populations, Europe.
Identifiers: *Lake rehabilitation, Lake Trummen(Sweden), Lake Hornborga(Sweden).

Lake Trummen (Central South Sweden) and Lake Hornborga (between Lakes Vattern and Vannern), characterized as having been irreversibly damaged by man, are described before, during, and after intervention. Until 1958 Lake Trummen received town sewage and wastewater from a flax factory. Intensive limnologic studies were started in 1968, a detailed restoration plan was developed in 1969, and the restoration process begun in 1970-1971. In unrestored Lake Trummen no submerged vegetation was able to develop. Prior to pollution the regionally characteristic plant species, Isoetes lacustris and Myriophyllum alterniflorum, were common. At the early stage of restoration there are unmistakable indications of considerable improvement. Lake Hornborga has been lowered five times between 1802-1933. From 1933 to 1954 the whole lake area was dry during summer. Since 1954 part of the lake is diked-in. Water depth is maximally 80 cm. Lake Hornborga was considered an important waterfowl lake in Western Europe, but lowerings resulted in a rapid decrease in ornithologic value. Lowerings have caused an almost complete overgrowth of emergent macrophyte vegetation, mainly Phragmites communis, resulting in voluminous detritus deposition. In some areas it is possible to remove the emergent vegetation by mechanical treatment and allow submerged vegetation to flourish. (Jones-Wisconsin)
W75-08124

LIMNOLOGICAL OBSERVATIONS ON AN ULTRA-OLIGOTROPHIC LAKE IN OREGON, USA,
K. W. Malueg, J. R. Tilstra, D. W. Schultz, and C. F. Powers.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 292-302, 1972. 7 fig, 4 tab, 11 ref.

Descriptors: *Baseline studies, *Oligotrophy, *Lakes, Oregon, Physicochemical properties, Limnology, Temperature, Light penetration, Biological properties, Hydrogen ion concentration, Dissolved oxygen, Conductivity, Nitrogen, Phosphorus, Chlorophyll, Phytoplankton, Zooplankton, Productivity, Bacteria, Submerged plants.
Identifiers: *Waldo Lake(Ore).

Waldo Lake, Oregon, is located in the Cascade Mountain Range at an altitude 1650 m. It is the headwater of North Fork of Willamette River, and is surrounded by coniferous forests, predominately Douglas fir, pine, and hemlock. It has been accessible only by trail or four-wheel drive vehicle, until, in 1969, a paved road was built linking it with a major highway. This investigation was designed to elaborate on an earlier survey and comprehensively document the unusual limnology of this body of water. Results would serve as a baseline for future investigations. Data are reported from only one station, located at maximum depth. Temperature, light penetration, water transparency, pH, dissolved oxygen and specific conductance were measured. Samples for nitrogen and phosphorus analyses were preserved. Biological measurements included chlorophyll-a, phytoplankton, zooplankton, primary productivity, and bacteria. Plankton net haul samples revealed no zooplankton at any time. Two plants were growing luxuriously on the sediment at 127 m depth, a hepatic, Jungermannia triris and a moss, Hygrohypnum (molle.); both appeared in excellent physiological condition. Limnological data from 1969 and 1970 indicate Waldo Lake as one of the most oligotrophic lakes in the world. (Jones-Wisconsin)
W75-08125

SEASONAL BIOLOGICAL STRUCTURE OF LAKE ONEGA,
I. I. Nikolaev.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 542-547, 1972. 4 fig.

Descriptors: *Lakes, *Seasonal, *Biological communities, Oligotrophy, Biomass, Cycles, Productivity, Distribution, Temperate, Stratification.
Identifiers: *Lake Onega(USSR).

The annual cycle of structural and functional changes in Lake Onega, USSR, as well as other lakes, is generally determined by cycle of incoming solar radiation. The significance of hydrological processes in biological cycles is clearly revealed in productivity and distribution of pelagic

communities, particularly, phyto- and zooplankton. Early spring development of phytoplankton is determined by Diatomeae with predominating Melosira islandica subsp. helvetica and M. distans var. alpigena. During the latter half of spring bacterioplankton density increases. In the second half of May when water temperature on shoals rises to 6-10C, zooplankton composition becomes more diverse, its numbers and biomass increasing rapidly; this period is also the time for macrophytes and reproduction by most fish species. An arbitrary date for the biological summer is July 1-10, when the thermal bar disappears and horizontal stratification in the pelagic zone changes into verticality. The zooplankton distribution in the vertical zones are formed by hypolimnetic and epilimnetic ecological complexes. Phytoplankton productivity in summer is very low. One of the features of the summer season is the maximum development of macrophytes and periphyton. The autumnal phyto- and zooplankton show a partial return to the spring pattern. (Jones-Wisconsin)
W75-08126

APPLICATION OF A MODEL TO AN ESTUARINE ECOSYSTEM,
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Lab.
T. Wyatt, and S. Z. Qasim.
Limnol Oceanogr. Vol 18, No 2, p 301-306, 1973, Illus.
Identifiers: Annual cycles, *Ecosystems, Estuarine environment, Fish, *India(Cochin Backwater), *Model studies, *Primary production, *Plankton.

The annual cycles of primary production and plankton succession in the Cochin Backwater, South India, are examined in the context of a model given by Margalef. The increased flushing of the estuary caused by the southwest monsoon is seen as the main driving force behind the changes which take place. Fish production in the estuary is high when compared with primary production; it is suggested that detritus is an important component of the food web.--Copyright 1973, Biological Abstracts, Inc.
W75-08127

INCIDENT SOLAR IRRADIANCE AND UNDERWATER LIGHT PENETRATION AS CONTROLLING THE CHLOROPHYLL A CONTENT OF A SHALLOW EQUATORIAL LAKE (LAKE GEORGE, UGANDA),
Freshwater Biological Association, Ambleside (England); and Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
G. G. Ganf.
Journal of Ecology, Vol 62, No 2, p 593-609, 1974. 10 fig, 2 tab, 37 ref.

Descriptors: *Solar radiation, *Light penetration, *Chlorophyll, Shallow water, Tropical regions, Lakes, Africa, Phytoplankton, Photosynthesis, Euphotic zone, Sediments, Algae, Biomass, Respiration, Primary productivity.
Identifiers: *Lake George(Uganda).

The inter-relationship between light penetration and chlorophyll-a in Lake George, Uganda, are set against the background of recorded solar radiation values. The underwater light climate is determined by the extinction due to phytoplankton and non-algal material. These values, coupled with a knowledge of the vertical phytoplankton distribution, may be used to determine the maximum algal crops that could occur in Lake George. The vertical extinction coefficients of photosynthetically available irradiance show a minimum in the red spectral region, typical of lakes with dense phytoplankton crops. The depth of the euphotic zone was calculated by two methods. Since the observed values of population content within the euphotic zone are close to the predicted maximum values the lake approaches the upper limit of crop density for its environment. The superficial sediments contain high concentrations of viable phytoplankton; since there is a frequent exchange of material between sediments and open water it is suggested that a more realistic mean algal biomass is about 1000 mg chl-a/sq m instead of about 600 mg/sq m. This may be sustained by the observed daily values of integral photosynthesis only because the photosynthesis and respiration components of the phytoplankton are vertically separated. (Jones-Wisconsin)
W75-08128

LOSS RATES FROM A LAKE PHYTOPLANKTON COMMUNITY,
California Univ., Davis. Inst. of Ecology.
A. D. Jassby, and C. R. Goldman.
Limnology and Oceanography, Vol 19, No 4, p 618-627, 1974. 3 fig, 44 ref. NSF GB-6422X and GB-35371.

Descriptors: *Fluctuation, *Population, *Phytoplankton, Primary productivity, Biomass, California, Standing crops, Lakes, Temporal distribution, Mortality.
Identifiers: *Algal losses, Castle Lake(Calif).

The discrepancy between primary productivity and actual biomass changes in a water column in Castle Lake has been analyzed. Castle Lake lies in a protected cirque basin at a 1700 m altitude in northern California. Measurements of primary productivity and phytoplankton biomass are presented for an 8-month period. Primary productivity and phytoplankton carbon content under a square meter of lake surface exhibit similar seasonal trends and achieve maximum values in July. Phytoplankton loss rates are calculated by subtracting the rate of change of carbon content from the primary productivity, and specific loss rates are estimated by dividing loss rates by phytoplankton carbon. Specific loss rates range from more than 0.80 per day in May to less than 0.20 per day in midsummer and in December. Loss rates in the spring cannot be attributed to water transport, sinking, or grazing. Cell mortality and decomposition when environmental tolerances are exceeded may be significant causes of phytoplankton loss in the lake. Mathematical models of primary productivity should include phytoplankton mortality unrelated to grazing. (Jones-Wisconsin)
W75-08129

GROWTH OF SELENASTRUM CAPRICORNUTUM IN NATURAL WATERS AUGMENTED WITH DETERGENT PRODUCTS IN WASTEWATERS,
Lake George Limnological Research Center, Inc., Troy, N.Y.
J. J. Ferris, S. Kobayashi, and N. L. Clesceri.
Water Research, Vol 8, No 12, p 1013-1020, 1974. (Rensselaer FWI Report 74-21). 4 fig, 3 tab, 8 ref.

Descriptors: *Eutrophication, *Detergents, *Phosphorus, Growth rates, Algae, New York, Lakes, Waste water treatment, Sewage effluents, Phosphates, Phosphorus compounds.
Identifiers: *Selenastrum capricornutum, Snyders Lake(NY), Lake George(NY), Saratoga Lake(NY).

To determine whether removal of phosphates from detergents would significantly alter the ability of domestic secondary sewage effluent to stimulate algal growth in receiving waters, growth of the alga Selenastrum capricornutum was tested in waters of different trophic states: receiving water alone or with sewage effluent containing non-phosphate detergent or soap, sewage effluent containing phosphate detergent, sewage effluent chemically treated to remove nutrients (especially phosphorus), or treated effluent plus added phosphorus. The three lakes located in northeastern New York used as sources of test water had total phosphorus concentrations ranging from 0.01-0.04 mg P/l. Algal growth was stimulated in the lake waters by secondary sewage containing detergents with or without phosphate. Significant algal growth occurred in two samples with a concentration of 60 microgram P/l, but concentrations up to 110 microgram P/l did not induce such a response in the third sample. It is difficult to attach more significance to the effect of detergent products on algal growth than to secondary sewage alone. Tertiary treatment by alum precipitation of secondary sewage containing phosphorus formed an effluent which did not enhance algal growth when added to lake waters. Agents other than phosphorus are partly responsible for the algal growth observed. (Buchanan-Davidson-Wisconsin)
W75-08130

LIMNOLOGICAL CONDITIONS IN FIVE SMALL OLIGOTROPHIC LAKES IN TERRA NOVA NATIONAL PARK, NEWFOUNDLAND,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
J. J. Kerekes.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 555-581, 1974. 17 fig, 13 tab, 67 ref.

Descriptors: *Lake morphometry, *Oligotrophy, *Physicochemical properties, Lakes, Phytoplankton, Depth, Salinity, Phosphorus, Chlorophyll, Nutrients, Solar radiation, Light penetration, Color, Primary productivity, Canada, Water temperature, Dissolved oxygen, Oxygen sag, Turbidity, Hydrogen ion concentration, Alkalinity, Carbon, Nitrates.
Identifiers: Terra Nova Natl Park(Newfoundland), Water renewal rate.

Selected physicochemical characteristics and morphometric factors are described and related to phytoplankton production in five small lakes in eastern Newfoundland. The lakes, varying in mean depth, in water renewal rate, in salinity, in total phosphorus, and in chlorophyll-a concentrations, were investigated during 1969 and 1970. Hypolimnetic oxygen deficits ranged between 111 and 217 mg oxygen/sq m/day. Low nutrient levels, reduced solar radiation, and low underwater light penetration, owing to excessive cloudiness and high water color, seriously limited planktonic primary production. The relation between primary production at optimum light, and water renewal per annum, appeared to be curvilinear when the rate of primary production began to decline above an optimum water renewal rate. The seasonal and annual variations in water color and salinity were dependent on the rate of water renewal, but other lakes on the catchment areas modified that relation. Winter road salting operations within the catchment area caused a considerable increase in salinity, total phosphorus concentration, and primary production in one lake. Anew morphometric index which reflects the littoral effect on the lake basin volume is proposed. (Jones-Wisconsin)
W75-08131

VERTICAL DISTRIBUTION OF PLANT NUTRIENTS,
Oklahoma Cooperative Fishery Unit, Stillwater.
D. W. Toetz.
Completion Report Oklahoma Proj F-27-1, 1972. 3 tab, 6 ref.

Descriptors: *Cycling nutrients, *Spatial distribution, *Nutrients, Oklahoma, Destratification, Stratification, Nitrates, Reservoirs, Phosphates, Hypolimnion, Epilimnion, Nitrification, Nitrogen, Aeration, Denitrification, Nitrites.
Identifiers: Lake Eufaula(Okla).

An attempt was made to destratify the central pool of Lake Eufaula, Oklahoma, and nutrient cycling during destratification was studied. In stratified lakes, nitrate is absent from bottom waters, while phosphate concentrations are higher in the hypolmnion than in the epilimnion. It was hypothesized that destratification would lead to an

orthograde distribution of these nutrients. Total and total dissolved phosphorus were many times higher near the bottom than in the surface. Phosphorus depletion was never evident. It is not possible to learn from these data if the sediments were a source or a sink for phosphorus during destratification. The data indicate that the destratification effort did not bring about complete mixing of phosphorus. It appears that during June, only two processes were affecting nitrate concentration: nitrate assimilation and nitrification. In general, nitrate-nitrogen was lower at the surface than near the bottom during July, implying a high uptake there or intense nitrification close to the sediments. After aeration began, chlorophyll-a concentrations decreased at all stations, but later the concentrations rose. No nitrate could be detected and only 12 micrograms nitrate-nitrogen was observed in the water samples. (Jones-Wisconsin)
W75-08132

PRIMARY REPRODUCTION STUDIES IN SHALLOW AQUATIC ENVIRONMENTS IN SOUTHERN ILLINOIS,
M. Munawar, J. Verduin, and I. Fatima.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 113-120, 1972. 2 fig, 6 tab, 25 ref.

Descriptors: *Primary productivity, *Shallow water, Illinois, On-site investigations, Carbon dioxide, Biological communities, Cladophora, Cyanophyta, Diurnal, Respiration, Photosynthesis, Variability.
Identifiers: Campus Lake(Ill), Carbondale(Ill).

Primary production studies were made in shallow aquatic environments (about 1 decimeter), sampling at least three times weekly and three time daily for an extensive period. Two techniques were followed simultaneously: a pH meter for carbon dioxide changes and an oxygen probe for oxygen changes. Significant differences were revealed for communities dominated by different species. Lowest rates (70 micromoles/gram dry weight of algae per hour) were observed for communities dominated by Cladophora; highest rates (580) for communities dominated by Cyanophyta. A pronounced diurnal trend was established with the highest rates in the morning, declining to rates one-half or less in the late afternoon. Respiration rates were one-fourth to one-sixth as high as gross photosynthesis, and did not show consistent diurnal trends. Experiments utilizing carbon dioxide-fertilized waters revealed enhanced photosynthetic rates in communities dominated by filamentous algae, but not in blue-green communities. In all communities an interesting phenomenon of carbon dioxide-uptake was encountered in dark bottles, exhibiting dark carbon dioxide-absorption similar to that attributable to photosynthesis. Photosynthetic rates under natural conditions average 8 micromoles/l of water per hour, agreeing closely with data reported for less shallow environments. (Jones-Wisconsin)
W75-08133

DIURNAL MIXING AND THE VERTICAL DISTRIBUTION OF PHYTOPLANKTON IN A SHALLOW EQUATORIAL LAKE (LAKE GEORGE, UGANDA),
Freshwater Biological Association, Ambleside (England); and Royal Society African Freshwater Biological Team, Lake Katwe (Uganda).
G. G. Ganf.
Ecology, Vol 62, No 2, p 611-629, 1974. 7 fig, 4 tab, 38 ref.

Descriptors: *Diurnal, *Mixing, *Spatial distribution, *Phytoplankton, Shallow water, Thermal stratification, Density, Velocity, Chlorophyta, Cyanophyta.
Identifiers: *Lake George(Uganda), Species stratification, Gas vacuoles, Sinking rates.

The diurnal changes of thermal stratification and vertical phytoplankton distribution which occur in the African Lake George are illustrated and these changes are analyzed in terms of sinking rates, density gradients, and water velocity. Lake George, shallow equatorial lake, stratifies diurnally. During the night and early morning the column is isothermal, over mid-day it is thermally stratified but isothermal conditions return with the onset of light evening winds. Phytoplankton is usually evenly distributed during the night and early morning. During mid-day the majority of the community sinks to deeper water and marked chlorophyll-a gradients occur. Towards evening the phytoplankton resumes uniform distribution, concurrent with the return to isothermal conditions. Surface accumulations of Microcystis, during calm mid-day periods, were noted. Algal counts revealed difference of behavior between species. Strong winds may resuspend previously settled phytoplankton. Algal counts suggest that the survival ability of chlorophytes within the anoxic lake sediments is poor when compared with the survival of blue-green algae and Synedra sp. Diurnal changes of the vertical phytoplankton distribution are interpreted as a function of diurnal and depth variations of Richardson's number and of the influence of excess algal density during periods of minimum turbulence. (Jones-Wisconsin)
W75-08134

CHANGES IN LAKE NORRVIKEN AFTER SEWAGE DIVERSION,
I. Ahlgren.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 355-361, 1972. 4 fig, 3 tab, 5 ref.

Descriptors: *Sewage effluents, *Diversion, *Pollution abatement, Yeasts, Nitrogen, Phosphorus, Eutrophication, Water quality, Phytoplankton, Biomass, Primary productivity, Sedimentation, Lake sediments, Carbon, Limiting factors, Europe.
Identifiers: *Lake Norrviken(Sweden).

Lake Norrviken in central Sweden has for many years received sewage of both domestic and industrial origin. A yeast factory was by far the largest contributor of nitrogen and phosphorus, thus the lake has become strongly eutrophic. In 1969 all sewage effluents were diverted from the lake. In two years following this diversion slight improvements of water quality have been noted. Total N concentration has decreased from 5-6 to 2-3 mg/l, and there is evidence that N was a limiting factor for phytoplankton growth in 1970. P concentration has decreased very slowly from 300-400 to 200-300 micrograms/l. Phytoplankton biomass was much smaller in 1970 than previous years, but primary production was larger than that measured in 1961/62. Sedimentation of P in 1970 was estimated to be 3.1 g/sq m and the release of P from the sediments 2.7 g/sq m. This means that sedimentation and release of P approximately counterbalance each other. Further recovery of the lake is not expected unless the P concentration in the main tributary decreases to much lower values. (Jones-Wisconsin)
W75-08135

ZOOPLANKTON OF THE ST. LAWRENCE GREAT LAKES--SPECIES COMPOSITION, DISTRIBUTION, AND ABUNDANCE,
Canada Centre for Inland Waters, Burlington (Ontario).
N. H. F. Watson.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 783-794, 1974. 3 fig, 2 tab, 45 ref.

Descriptors: *Zooplankton, *Great Lakes, *Distribution, Seasonal, Lake Erie, Lake Huron, Lake Ontario, Lake Superior, Biomass, Crustaceans, Varieties, Rotifers, Migration, On-site investigations, Sampling.

Considerable detail about seasonal changes in species composition, total numbers, and vertical and horizontal distributions of zooplankton was compiled from a broad synoptic coverage of sampling stations and repeated cruises in the Great Lakes. Maximum numbers were observed in Lake Erie. Considerably fewer organisms were found in periods of peak abundance in Lakes Ontario and Huron. No firm estimates are available for Lake Superior but numbers from one cruise indicate still lower values there. Biomass estimates (either as ash-free weight of material from plankton net hauls or from conversions of numbers to biomass from dry weight factor for individual species) are highest for Lake Erie, but reflect the larger size of organisms in the other lakes, especially Huron and Superior. Species distributions are now reasonably well known for crustaceans, except in one or two taxa of the cladocerans, Daphnia and Bosmina. Recent studies made on the rotifers have not fully defined their numbers, distribution, and their ecological role. Similarly, distribution and role of protozoan groups have been largely ignored. Several computer techniques are suggested for handling and analysis of the large quantities of data generated on lakewide surveys including community coefficients and cluster analyses. (Jones-Wisconsin)
W75-08136

A COMPARATIVE REVIEW OF PHYTOPLANKTON AND PRIMARY PRODUCTION IN THE LAURENTIAN GREAT LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
R. A. Vollenweider, M. Munawar, and P. Stadelmann.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 739-762, 1974. 13 fig, 3 tab, 88 ref.

Descriptors: *Phytoplankton, *Primary productivity, *Great Lakes, Biological communities, Biomass, Lake Ontario, Reviews, Lake Erie, Lake Huron, Lake Superior, Lake Michigan, Dynamics, Eutrophication, Varieties, Photosynthesis, Chlorophyll, Succession, Distribution, Annual, Trophic level.

Species composition of phytoplankton in the Laurentian Great Lakes, its biomass concentration, and its physiological activity measured as photosynthesis related to eutrophication, are reviewed and discussed. Mean surface densities of phytoplankton biomass and mean concentration of total chlorophyll-a are computed for Lake Ontario. Detailed year-round species succession is described. Four biomass peaks were observered in inshore regions while offshore regions had only one pulse. Average surface phytoplankton biomass and average total chlorophyll-a are given for Lake Erie. Algal species identified numbered 250. Chlorophyta made up 60% followed by by Diatomeae, Dinophycinae, Chrysomonadinae, the rest from other groups. Average phytoplankton biomass values of lakes Ontario and Erie, calculated on a lakewide basis differed little. In open Lake Huron mean concentration of total chlorophyll-a was about 2 mg/cu m; eutrophic Saginaw Bay exhibited up to 30 mg/cu m. From Lake Superior, analyses of spring and summer samples indicate low phytoplankton biomass and algal populations composed not only of diatoms but also of chrysomonads, cryptomonads, dinoflagellates, greens, and bluegreens. Lake Michigan studies indicated diatoms the dominant phytoplankton but phytoflagellates are commonly found. Primary production and trophic status of Great Lakes are presented. (Jones-Wisconsin)
W75-08137

ON THE EFFECTS OF EUTROPHICATION ON LAKE PAIJANNE, CENTRAL FINLAND,
P. Tuunainen, K. Granberg, L. Hakkari, and J. Sarkka.
Verhandlungen Internationale Vereinigung Limnologie, Vol 18, p 388-402, 1972. 6 fig, 7 tab, 32 ref.

Descriptors: *Oligotrophy, *Water pollution effects, *Eutrophication, *Biological communities, Europe, Domestic wastes, Industrial wastes, Zooplankton, Distribution, Fish, Benthic fauna, Primary productivity, Organic loading, Bioindicators.
Identifiers: Lake Paijanne(Finland).

The reactions of an aquatic biocoenose, an oligotrophic and oligohumic lake, into which different kinds of waste waters are discharged are described. Paijanne is the central lake of the Kymijoki watercourse, the second largest watercourse in Finland. The total effluent load up to 1969 was calculated to be equal to the wastes of about 1.7 million people. In the central parts of Lake Paijanne waste waters from the wood-processing industry predominate. The lake contains areas ranging from oligotrophic to eutrophic. Eutrophication seems to affect the zooplankton species composition through chemical environmental factors and through food organisms (algae and bacteria), and by lack of planktivorous fishes in some areas. The number of species of bottom fauna is smallest in the most polluted areas and different species occur most evenly in the cleanest areas. In the areas loaded by the wood-processing industry the percentage of roach is clearly lower and the percentage of perch higher than in those loaded by urban wastes. In eutrophic areas vendace is almost totally absent and smelt is most important pelagic species. In clean areas the abundance of perch is prominent. (Jones-Wisconsin)
W75-08138

AVAILABILITY OF PHOSPHORUS-32, ADSORBED ON CLAY PARTICLES, TO A GREEN ALGA,
Michigan Agricultural Experiment Station, East Lansing.
L. A. Helfrich, and N. R. Kevern.
Michigan Academician, Vol 6, No 1, p 71-81, 1973. 5 fig, 21 ref.

Descriptors: *Phosphorus, *Adsorption, *Clays, *Chlorophyta, Runoff, Kaolinite, Sediments.
Identifiers: *Phosphorus sources, Clay particles, Pandorina morum.

Whether phosphate adsorbed on clay particles, as representative of drainage water sediments is available to phosphate-limited Pandorina morum is determined and some parameters influencing phosphorus availability are examined. Effects of light on uptake of adsorbed P-32 by algal cells are described. Kaolinite, a clay mineral whose role in phosphate fixation in soils has been established, was used to represent typical suspended and settleable sediments in aquatic systems. Centrifugation and density gradient separation procedures were used to fractionate water samples into three categories: culture media, clay particles, and algal cells. Initially all phosphorus introduced to the cultures was adsorbed on clay particles. Mean percentage of the total amount of P-32 present in the algal cells and clay particles for each day is shown. Results serve to emphasize the potential role of clay particles in supplying phosphorusnecessary for algal nutrition. That phosphate-limited P. morum can obtain this nutrient adsorbed to clay particles was demonstrated. The relatively high concentrations of radiophosphorus found in the algal cells demonstrates movement of the isotope from the tagged clay to the cells. (Jones-Wisconsin)
W75-08139

INFLUENCE OF EFFLUENTS OF SULPHITE CELLULOSE FACTORY ON ALGAE IN CULTURES AND RECEIVING WATERS,
Jyvaskyla Univ. (Finland). Dept. of Biology.
P. Eloranta.
Vattern, Vol 30, No 1, p 36-48, 1974. 13 fig, 2 tab, 22 ref.

Descriptors: *Industrial wastes, *Sulfite liquors, *Pulp wastes, *Water pollution effects, Bleaching wastes, Toxins, Bioassay, Phytoplankton, Eutrophication, Acidity, Europe, Inhibition, Chlorides, Calcium, Pulp and paper industry.
Identifiers: Ankistrodesmus falcatus, Jyvaskyla(Finland).

Effect of effluents from a sulphite cellulose factory on growth of pure cultures of Ankistrodesmus falcatus v. acicularis was studied. Effluents were taken from three main lake outfalls discharging wastes of barking works, cellulose factory, bleaching works, and other factory processes. Results were compared with observations on phytoplankton occuring in nature in waters receiving factory effluents. The effluents had toxic and growth-inhibiting and -stimulating effects on algae. Effluents with clearest toxic and inhibitory effects were from the factory processes and from its main waste conduit. Toxicity is probably attributable to acidity. The effluent from the main concuit occasioned an initial inhibition of growth, the duration of which depended on the amount of algae in the culture. This growth-inhibiting effect is presumably attributable to the sulphur compounds contained in the effluent. The barking works effluent promoted algal growth evidently due to its phosphorus content. The bleaching works effluent did not have any particular effect on algal growth. Effluent from the main conduit of the cellulose factory also had a growth-stimulating effect. At their highest concentrations, the effluents exerted an inhibiting effect on all algal groups, decreasing species numbers and total biomass. (Jones-Wisconsin)
W75-08140

THE DISTRIBUTION OF EPIPHYTIC DIATOMS IN YAQUINA ESTUARY, OREGON (U.S.A.),
Wartburg Coll., Waverly, Iowa. Dept. of Biology.
S. P. Main, and C. D. McIntire.
Botanica Marina, Vol 17, No 2, p 88-89, 1974. 4 fig, 6 tab, 35 ref. NSF GB18591, GA33231.

Descriptors: *Spatial distribution, *Periphyton, *Diatoms, *Estuaries, Oregon, Aquatic plants, Seasonal, Varieties, Intertidal areas, Biological communities, Salinity, Hosts.
Identifiers: *Epiphytic diatoms, Yaquina Estuary(Ore), Zostera marina, Fucus evanescens, Enteromorpha, Polysiphonia, Ulva.

A qualitative and quantitative analysis of diatom flora associated with selected macrophytes in the Yaquina Estuary, Oregon, is reported. These assemblages were examined in relation to vertical, horizontal, and seasonal environmental gradients and to the host macrophytes. The diatom assemblages were epiphytic on host plants, except for one endophytic taxon. Information about the systematics of estuarine diatoms and hypotheses related to host-epiphyte interactions are contributed. Epiphytic diatom assemblages in the intertidal zone were sampled from the host macrophytes Zostera marina, Fucus evanescens, and Enteromorpha species, Polysiphonia, and Ulva. In general, host-epiphyte specificity was not apparent. The structure of diatom assemblages on adjacent host macrophytes of the same species often differed as greatly as the community structures of assemblages from nearby host macrophytes of different species. Differences in community structure between assemblages in September and May were correlated with horizontal salinity gradients, to vertical exposure, and insolation gradients. In January, differences between assemblages apparently were also related to biological factors involving host-epiphyte interactions, and the condition of the host macrophyte was probably the basis for this interaction. The epiphytic diatom flora was similar in species composition to the epilithic flora described in an earlier study. (Jones-Wisconsin)
W75-08141

COMPLEXING CAPACITY OF THE NUTRIENT MEDIUM AND ITS RELATION TO INHIBITION OF ALGAL PHOTOSYNTHESIS BY COPPER,
Canada Centre for Inland Waters, Burlington (Ontario).
R. Gachter, K. Lum-Shue-Chan, and Y. K. Chau.
Schweizerische Zeitschrift fur Hydrologie, Vol 35, No 2, p 252-261, 1973. 2 fig, 3 tab, 35 ref.

Descriptors: *Chelation, *Algal control, *Copper, *Toxicity, *Inhibition, Chlorella, Ions, Inorganic compounds, Photosynthesis.
Identifiers: *Copper detoxification, Ligands.

How much ionic copper could be masked by filtered lake waters and by aged culture medium in which Chlorella had been grown and to relate this masking ability to a capacity to buffer further additions of copper without adversely affecting phytoplankton production was investigated. Natural waters have the property to mask added copper ions. This complexing capacity is attributed to ligands forming copper complexes. It is possible to measure this complexing capacity with relatively high accuracy. The complexing capacity of a water sample does not guarantee that the equivalent amount of copper could be tolerated by the system without adversely affecting phytoplankton production. It is not possible now either to measure the concentration of free copper ions in equilibrium with ligands or to estimate it indirectly by calculation, since the nature of ligands and therefore the formation constants with other metals are not known. If only ionic and not complexed copper is toxic, it is most probable that it inhibits photosynthesis of planktonic algae at concentrations of about 1 million mole/1. Seasonal variations of natural copper concentration in concert with the complexing property of the water might have an influence on phytoplankton succession. (Jones-Wisconsin)
W75-08142

PHYSICAL AND CHEMICAL LIMNOLOGY OF CHAR LAKE, CORNWALLIS ISLAND (75 DEGREES N LAT.),
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
D. W. Schindler, H. E. Welch, J. Kalff, G. J. Brunskill, and N. Kritsch.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 585-607, 1974. 15 fig, 6 tab, 44 ref.

Descriptors: *Physical properties, *Chemical properties, *Limnology, Canada, Polar regions, Lakes, Evaporation, Conductivity, Ice, Snow, Solar radiation, Freezing, Phosphorus, Nitrogen, Precipitation(Atmospheric), Nutrients, Silica, Chlorides, Sulfates, Bicarbonates, Arctic.
Identifiers: *Char Lake(Canada).

Although limnological research has been carried out in the arctic for several decades, data on high arctic lakes are few. Seasonal data for several physical and chemical variables in Char Lake are given. Lake temperatures were measured at 1-m intervals and ice thickness near the center of the lake. Snow measurements were made at irregular intervals and surface irradiance at lake-side. Light energy entering the water was calculated. Annual cycles of major solutes are influenced primarily by freeze-thaw cycles. Concentrations of most substances are increased by freezing-out during winter. Because the lake does not circulate during maximum spring meltwater flow, this freezing-out maintains concentrations above those in inflow streams. Concentration of phosphorus and nitrogen are low throughout the year. Precipitation contains little phosphorus or nitrogen. Inputs of phosphorus and nitrogen are calculated to be 0.016 and 0.314 g/sq m, respectively. Retention of nutrients is lower than in temperature regions, although quite efficient. With the exception of silica, return of ions from sediments during winter was negligible. Disturbance of one inflow stream due to airstrip constuction caused great increases in concentrations of nitrogen, silica, chloride,

sulfate, and bicarbonate in the stream. (Jones-Wisconsin)
W75-08143

A REVIEW OF RESEARCH ON THE LIMNOLOGY OF WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnipeg. Dept. of Zoology.
F. J. Ward, and G. G. C. Robinson.
Journal Fisheries Research Board of Canada, Vol 31, No 5, p 977-1005, 1974. 11 fig, 12 tab, 52 ref.

Descriptors: *Limnology, *Productivity, Reviews, Canada, Phytoplankton, Diatoms, Anabaena, Zooplankton, Carbon, Varieties, Bacteria, Dominant organisms, Fish populations, Perches, Walleye, Organic compounds, Copepods, Daphnia, Fish diets, Biomass.
Identifiers: *West Blue Lake(Manitoba).

Previously unpublished data, information from theses, and data abstracted from published papers are reviewed. In spring 'net' phytoplankton diversity and abundance were highest with diatoms predominating. In summer Anagena spiroides and Aphanizomenon flos aquae were a major component. Cyclotella bodanica dominated in winter. Average summer phytoplankton primary productivity approximated 320 mg C/sq m/day. Average daily estimates (exclusive of zooplankton) of organic carbon in the euphotic zone during summer were, respectively, 5 and 8 g C/sq m. Kinetic parameters for bacterial uptake of 11 dissolved organic substrates are reported. Evidence for proliferation and adaptation of bacteria in sample bottles is presented and the absence of photoheterotrophy is described. Generally, Cyclops bicuspidatus was more abundant than Diaptomus siciloides; both were relatively scarce in summer. Daphnia pulicaria was usually most abundant in spring and early summer, and persisted at low levels during winter. Largest animals with high relative caloric content predominated in fall, winter, and early spring when reproduction was minimal. Northern pike, brook stickleback, lake trout, yellow perch and walleye inhabit the lake with the latter two most abundant. Perch are an important food for walleye consequently the feeding habits and general biology of perch were investigated. (Jones-Wisconsin)
W75-08145

KEYS TO WATER QUALITY INDICATIVE ORGANISMS (SOUTHEASTERN UNITED STATES),
Georgia State Coll., Atlanta.
FWPCA, November 1968. 197 p, 203 fig, 2 tab, 166 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Water quality, *Systematics, *Biology, *Southeast U.S., Aquatic fungi, Algae, Mollusks, Oligochaetes, Crustaceans, Aquatic insects, Mayflies, Stoneflies, Caddisflies, Midges, Freshwater fish, Freshwater, Bioindicators.

This manual was prepared as a reference for biologists in southeastern United States involved in water quality studies. In order to accurately identify those organisms most important in water quality surveys, illustrated keys of fungi, algae, Mollusca, Oligochaeta, Crustacea, Ephemoroptera, Plecoptera, Trichoptera, Chironomidae, and fish are presented, with labeled figures for each couplet, except in three sections. The section on fungi is merely an introduction indicating their occurence in nature and including a guide to the literature. Illustrated keys to algae and fish are available thus are not given in this publication, although a guide and key to the most commonly encountered algae is included. The freshwater biota of southeastern United States is not as well-known as those for other areas; much of the existing literature concerning life histories and ecological requirements is based on forms from other areas which are often not applicable to this region. Suggestions for reference materials with descriptions of the forms which have been keyed, for seeking information from specialists, and for preserving speciemens are made. Additional references are given in bibliographies for each section. Each key also includes information on known ecological requirements, distribution, etc., as an aid to water quality evaluations. (See W75-08147 thru W75-08156) (Buchanan-Davidson--Wisconsin)
W75-08146

FUNGI,
Georgia State Coll., Atlanta. Dept. of Biology.
D. G. Ahearn.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p C1-C8, FWPCA, November 1968. 21 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Aquatic fungi, *Systematics, Yeasts, Degradation (Decomposition), Bioindicators, Sewage bacteria, Sphaerotilus, Bacteria.
Identifiers: Sewage fungi.

A general introduction to fungi is given. Traditionally true fungi are classified as Eumycotina of phylum Mycota of the plant kingdom, but some consider fungi an esentially monophyletic group distinct from plants and animals. Most fungi have broad enzymic capacities, degrading polysaccharides, proteins, hydrocarbons, and pesticides. Most possess oxidative or microaerophilic metabolism, but some have anaerobic catabolism or metabolism. Fungi are ubiquitous in aquatic habitats, are important in mineralization of organic wastes, and may be used as indicator organisms. The most common 'sewage fungi' are Sphaerotilus natans and Leptomitus lacteus, but S. natans is actually a sheath bacterium. Both thrive in organically rich water, do not grow well above 30C, have oxidative metabolism and appear as reddish -brown flocs or stringy slimes. Deuteromycetes and phycomycetes may be more ecologically important than 'sewage fungi'. Usually classifications are based on morphology of sexual and zoosporic stages; however many fungi do not demonstrate these stages, thus classification should be based on morphological and/or physiological characteristics. A synopsis of fungi classification is presented. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08147

ALGAE,
Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. Cincinnati Water Research Lab.
C. M. Palmer.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p E1-E27, EWPCA, November 1968. 50 fig, 2 tab, 13 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Algae, *Bioindicators, *Systematics, Eutrophication, Water quality, Water pollution effects, Varieties.

Most algae are aquatic, are found in surface water exposed to sunlight, and can produce large quantities of organic matter. Algae and other aquatic plants and animals grow on dissolved and suspended nutrients and affect water quality. Algae may be unattached, grow collectively as plankton, or accumulate as blooms or blankets. Some aquatic, pigmented forms containing chlorophyll can swim or crawl, but are listed here as algae. Most algae important in sanitary science can be classified in four main groups: blue-green, pigmented flagellates, greens, and diatoms. Algal growth can be adversely affected by gross pollution with organic wastes, with the survivors useful as pollution indicators. Over 600 species and genera of pollution-tolerant algae were reported by 110 workers which are arranged in order of pollution tolerance. Twenty-two most tolerant algae genera and 20 most tolerant species are listed as aids for individuals engaged in stream pollution surveys or related projects. They represent a general consensus as to the relative significance of algae tolerant of organic wastes which have been reported. Particular care can thus be taken in biological surveys to check for the presence of these algae during sample examination. A taxonomic key to algae important in water pollution is given. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08148

MOLLUSCA,
Florida State Univ., Tallahassee. Dept. of Biological Science.
W. H. Heard.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p G1-G26, FWPCA, November 1968. 42 fig, 23 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Systematics, *Mollusks, *Southeast U.S., Gastropods, Snails, Clams, Analytical techniques, Freshwater, Speciation, Aquatic animals.

Distribution of gastropods (snails) and pelecypods (clams) found in southeastern United States freshwater varies and is sometimes inadequately known. Because taxonomic characteristics used to identify mollusks are somewhat inconsistent, separate keys for snails (univalved) and clams (bivalved) are presented in which the most striking shell characteristics are used, except when soft-part characteristics along are applicable. Snails are subdivided into those without an operculum (Subclass Pulmonata) and those with an operculum (Subclass Prosobranchia). Prosobranchia are subdivided into families Bythinidae, Neritidae, Pilidae, Pleuroceridae, Valvatidae, and Viviparidae and the Pulmonata into families Ancylidae, Lymnaeidae, Physidae, and Planorbidae,. Four families (Corbiculidae, Margaritiferidae, Sphaeridae, and Unionidae) of clams inhabit North America. Distribution of certain species vary widely, with the family Unionidae being the most widespread and abundant in southeastern United States. Careful narcotization to relax living animals in life-like positions, fixation to kill the animals, and preservation must be done to obtain a specimen showing minimal contraction and withdrawal into the shell, unharmed shell, and with soft-parts available for dissection of the reproductive system or preparation of radular mounts. Marsupial conditions found in the Unionidae are described. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08149

OLIGOCHAETA,
Toronto Univ. (Ontario). Dept. of Zoology.
R. O. Brinkhurst.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p I1-I17, FWPCA, November 1968. 14 fig, 6 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Oligochaetes, *Systematics, Worms, Tubificids, Freshwater, Speciation, Analytical techniques.

Oligochaeta can be classified into eight families which are found in freshwater habitats east of the Rocky Mountains: Aeolosomatidae, Naididae, Tubificidae, Enchytraeidae, Lumriculidae, Haplotaxidae, Opistocystidae, and Branchiobdellidae. The most important family, the Tubificidae, can be identified from simple whole-mounts, without keying out the genera; about half can be identified from immature specimens. Fewer than forty important species are known east of the Rockies. New species must be dissected for placement in genera, but can then be identified by superficial characteristics. Most Lumbriculidae must be dissected, but they are of limited importance. Worms may be killed and preserved in 70% alcohol, except for Branchiura sowerbyi which must be narcotized in 5% magnesium chloride before preservation. The first segment of oligochaetes is devoid of setae which are otherwise arranged in

four bundles on each segment (two dorsolateral and two ventrolateral). Detached as exually-produced forms differ as the dorsal setae is located in more anterior segments and the prostomium is absent. Setae are the principal features to study; they may be hair setae, bifid crotchets, pectinate setae, or genital setae. The commonest combinations of setae found in the various families are described. Taxonomic keys to freshwater oligochaetes and tubificids of Eastern North America is included. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08150

CRUSTACEA: MALACOSTRACA,
Smithsonian Institution, Washington, D.C. Dept. of Invertebrate Zoology.
H. H. Hobbs.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p K1-K36, FWPCA, November 1968. 33 fig, 30 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Crustaceans, *Systematics, Speciation, Amphipods, Isopods, Crayfish, Shrimp, Distribution, Southeast U.S.
Identifiers: *Malacostraca, Mysids, Decapods.

An illustrated key to freshwater Malacostraca occurring in southeastern United States contains descriptions of four orders: Isopoda, Amphipoda, Mysidacea, and Decapoda. The order Decapoda contributes the most species to epigean waters, with Astacidae (crayfish) outnumbering the Palaemonidae (shrimp). A number of undescribed species occur in the area and some may seem to fit couplets in the key, but identifications based on the key should be considered tentative until comparisons are made with full descriptions or with authoritatively determined specimens. Blue crab (Callinectes sapidus), typically marine forms which may invade freshwater in some localities, the introduced Saber crab (Platychirograpsus typicus), and albinistic (trogloditic) forms found in epigean waters near springs or streams issuing from underground water courses are not included in the key. Methods of collecting, preservation, preparation, and equipment for the examination of specimens are described in detail. The genus Macrobrachium can be identified only if males with the second pair of pereiopods intact are available. The key to crayfish is applicable only to first form males. Figures are given to illustrate the major characteristics used in identifcation, especially the first pleopod. Lists are given for species belonging to each genus with their known ranges. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08151

EPHEMEROPTERA,
Florida Univ., Gainesville. Dept. of Biological Science.
L. Berner.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p M1-M10, FWPCA, November 1968. 9 fig, 7 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Mayflies, *Aquatic insects, *Systematics, Speciation, Larvae, Varieties, Southeast U.S., Habitats.
Identifiers: Ephemeroptera.

A key is presented for the Ephemeroptera, listing only those genera known to occur in the southeastern United States. Mayfly nymphs are characterized by having chewing mouthparts, noticeable wing pads developing on the mesothorax, single larval claws, gills on abdominal segments 1-7 (some may be modified to form gill covers, others are vestigial, and some may be missing from certain segments), and an abdomen terminating in two or three long tails. All species require fresh water for development, although one Florida form tolerates a certain amount of salinity. The key should only be used with older insects since nymphs in their early instars are difficult to identify because distinctive traits have not developed. Since it may be hard to identify the first abdominal segment, counting should start with the most posterior or tenth segment and count anteriorly. Segment number is important to counting gills. Determination of the presence or absence of hind wing pads may also be difficult. The forewing pad must often be lifted to observe the hindwing pad. A brief statement of the most frequently encountered habitats in which the insect lives and the frequency of occurrence are given for each genus. Sketches of pertinent taxonomic characteristics are given. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08152

PLECOPTERA,
Massachusetts Univ., Amherst. Dept. of Entomology and Plant Pathology.
J. F. Hanson.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p P1-P6, FWPCA, November 1968. 13 fig, 3 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Stoneflies, *Systematics, *Aquatic insects, Bioindicators, Speciation.
Identifiers: *Plecoptera, Naiads.

The key to identify genera and subgenera to stoneflies by their most conspicuous characters and characters that are present in all or most of the stages of naiad growth is not a natural key. As presented, the characters are in decreasing order of importance. Because of high oxygen requirements, stonefly naiads live only in moving water and are often used to indicate lack of organic pollution. This may be true for species with long life cycles whose naiads spend two to four years in the water. Most species have a one year life cycle and often spend most of the year in the egg stage which is probably quite resistant to pollutants and tolerant of relatively low oxygen contents. Because many species have long egg stages, sampling may be difficult. In the summer it may be difficult to find stonefly naiads in streams that may have a varied and abundant fauna. Stoneflies are mobile, especially when the naiads are nearly full-grown and ready for emergence as adults, and may be carried downstream to emerge from polluted waters. Caution must be exercised in interpreting sample collections. More information is needed on stoneflies before they can be reliably used as pollution indicators. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08153

TRICHOPTERA,
Georgia Univ., Athens. Dept. of Entomology.
J. B. Wallace.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p S1-S19, FWPCA, November 1968. 26 fig, 8 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Caddisflies, *Aquatic insects, *Systematics, *Speciation, Varieties, Analytical techniques, Southeast U.S., Larvae, Habitats.
Identifiers: Trichoptera.

A taxonomic key is given for Trichoptera (caddisflies) which are found in southeastern United States, especially the southern Appalachians and their foothills. Most of the 19 families found in the United States are represented. Caddisfly larvae are found in habitats ranging from spring seeps and ponds to mountain streams. Larvae and pupae should be preserved in 80% ethyl alcohol, which should be changed after one week. Killing larvae in boiling water before preservation results in well extended specimens. Caddisfly larvae are of various types: free living forms (no cases or nets), net spinning forms (nets attached to plants, rocks, etc., which collapse when taken from the water), tube making forms (some psychomyiid larvae burrow into sandy bottoms of stream beds and cement tube walls), saddle case makers (Glossosomatidae live in tortoise-like cases of gravel), purse case makers (have a slit at each end of case for head and anal legs, found in many microcaddisflies or Hydroptilidae), and case makers (a variety of cases made from plant materials to sand grains). Some of the more important morphological characteristics used in larval identification are illustrated. The sclerites and/or setae may or may not be present, depending on the group. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08154

CHIRONOMIDAE,
Florida State Board of Health, Jacksonville.
W. M. Beck.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p V1-V22, FWPCA, November 1968. 16 fig, 7 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Diptera, *Aquatic insects, *Systematics, Analytical techniques, Southeast U.S., Florida, Larvae, Varieties, Midges.
Identifiers: *Chironomids, Tendipes, Pelopia, Tanypus.

The taxonomy of chironomids is based largely on adult morphology, but there is a need for knowledge of the identification and distribution of larvae. An estimated 400 species of chironomids are found in Florida, of which 275 adult species are named and fewer than 200 larvae are known. Many conflicts exist in the scientific nomenclature and several revisions of groups are currently being prepared which will necessitate revisions in portions of the key. Detailed directions are given for the preparation of slide mounts of specimens for larvae identification. The most important part for identification purposes is the head capsule which should be mounted ventral side up. The posterior portion bearing the posterior prolegs, supra-anal papillae, supra-anal bristles, anal gills, and blood gills is also important. Abdominal segments bearing lateral hair fringes, large setae, hair pencils. and special integument characteristics are of interest, but those of large larvae may be discarded. The key as presented has intentionally omitted a subfamily which is not found in the southeast, marine inter-tidal midges, and midges confined to highly specialized habitats. Suggestions are made for using the key: short cuts, calculation of the antennal ratio, and counting the number of teeth. (See also W75-08146) (Buchanan-Davidson--Wisconsin)
W75-08155

FRESHWATER FISHES,
Auburn Univ., Ala.
J. S. Ramsey.
In: Keys to Water Quality Indicative Organisms (Southeastern United States), p Y1-Y15, FWPCA, November 1968. 35 ref. FWPCA ITT1-WP-19-01.

Descriptors: *Freshwater fish, *Varieties, *Southeast U.S., *Bioindicators, Analytical techniques, Water pollution effects, Eutrophication, Bibliographies, Fish types, Fish behavior, Streams, Darters, Yellow perch, Rainbow trout, Brook trout, Pikes, Shiners, Minnows, White bass, Suckers, Channel catfish, Bass, Lake trout, Catfishes, Carp, Salmon, Cisco, Smelt, Walleye, Sculpins, Perches, Sunfishes, Lampreys.
Identifiers: Goldfish, Bluegills, Mountain whitefish, Mosquitofish, Swampfishes, Shad.

Methods of collection, preservation, labeling, and identification of freshwater fishes are described in detail. A bibliography containing useful modern references for identification of Eastern fishes containing 31 references is given as well as several references on fish distribution relative to the presence or absence of pollution. An attempt was

being made to determine tolerance levels or ecological requirements for 20 representative fish species and a number of fish were being tested against overall and specific pollutants. Possibly the only species which consistently thrives in polluted waters in Central and Southern U.S. is the mosquitofish (Gambusia affinis). In the Southern states three species seem to adapt to or tolerate a variety of pollutants that eliminate other fish, especially in small streams: the mosquitofish, the green sunfish (Lepomis cyanellus) and the bluegill (Lepomis macrochirus). In larger streams the fathead minnow (Pimephales promelas) also survives. If only one or a combination of these four species occurs pollution may be indicated. Several species of non-sessile habit are indicators of good water quality in Southern or Coastal Plain waters. A complete survey of fishes in a locality is desirable for proper pollution analysis. Knowledge of the normal habitat and natural fish limitation is essential for determining water quality. (See also W75-08146) (Auen-Wisconsin)
W75-08156

PHYTOPLANKTON GROWTH, DISSIPATION AND SUCCESSION IN ESTUARINE ENVIRONMENTS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
H. H. Seliger.
Available from the National Technical Information Service, Springfield, Va 22161 as COO-3278-27, $4.00 in paper copy, $2.25 in microfiche. Progress report through April 1974. 35 p, 5 fig, 18 ref. AEC AT(11-1)3278.

Descriptors: *Estuaries, *Chesapeake Bay, *Plankton, Phytoplankton, Model studies, Primary productivity, Light, Nutrients, Secondary productivity, Sampling, Instrumentation, Succession, Microorganisms, Maryland.
Identifiers: *Rhode River(Maryland).

A progress report covering three years of research of the plankton dynamics at the Rhode River, a subestuary of Chesapeake Bay, briefly describes the scope and theoretical approach of the following research areas: Light- and nutrient-dependent physiology of estuarine phytoplankton; the relative contributions of phytoplankton primary production and bacterial (detrital) secondary production to the nutrition of the microzooplankton and possible filter feeders; instrumentation techniques, diagnostic parameters and sampling procedures for analyzing phytoplankton growth, dissipation and species succession; and development of a plankton model for comparable sections of subestuaries which can define the system's stability in relation to its response to nutrient, biocide, or thermal loading. Comprehensive details of each research phase are given in the parenthetically numbered documents, available separately under the following titles: Investigations of the light environment in Rhode River (COO-3278-24), Natural phytoplankton community and the requirement for in situ diffusible containers (COO-3278-16), Rotifer biomass and predation rates (COO-3278-3), Carbon limitations in Chesapeake Bay (COO-3278-21), Cooperative studies on baywide phytoplankton distributions (COO-3278-26), In vivo fluorescence of chlorophyll-a (COO-3278-22), and, The effects of Trophical Storm Agnes on the phytoplankton in the Rhode River (COO-3278-23). (Auen-Wisconsin)
W75-08157

ALGAL BIOMASS PROJECTIONS FOR THE PROPOSED KICKAPOO RIVER IMPOUNDMENT,
Wisconsin Univ., Madison. IBP Lake Wingra Project.
E. H. Dettman.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 117-124. 4 fig, 4 ref. DACW 37-C-0130.

Descriptors: *Reservoirs, *Cyanophyta, *Biomass, Eutrophication, Nuisance algae, Wisconsin, Aquatic plants, Absorption, Nutrients, Computer models, Nitrogen, Diatoms, Phosphorus.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

Computer simulations of algal biomass in Lake La Farge, Wisconsin, the proposed Kickapoo River impoundment, between April to mid-September were made with a model of biomass, nitrogen, and phosphorus dynamics in freshwater lakes to indicate the general range of actual lake behavior. Simulations showed that nutrients would support a mean algal biomass of 6.1-9.5 g dry weight/sq m. Macrophyte uptake would reduce mean algal density 4-8% thus should not cause a major reduction of algal abundance. Reduced nutrient loading would lower algal biomass; a reduction of 28% would decrease biomass by 19%. Investigation of model behavior for buoyant blue-green algae indicated the potential for densities in the range of 12-18 g dry weight/sq m. The simulations indicate a trend toward a decrease in algal biomass in July, August, and September when blue-green species are present. The algae developing a deep system like Lake La Farge would probably be the more buoyant, scum-forming species. Simulated blue-green algal levels appear to be partially limited by the algal sinking rate and not phosphorus, consequently the late summer algal biomass may be higher than computed. Large blooms of noxious species may occur in late summer. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08162

RUNOFF FROM AN INTERTIDAL MARSH DURING TIDAL EXPOSURE - RECESSION CURVES AND CHEMICAL CHARACTERISTICS,
South Carolina Univ., Columbia. Belle W. Baruch Coastal Research Inst.
For primary bibliographic entry see Field 2L.
W75-08193

OXYGENATION OF LAKE HYPOLIMNIA,
Rutgers-The State Univ., New Brunswick, N.J. Water Resources Research Inst.
W. Whipple, J. V. Hunter, F. B. Trama, and J. R. Westman.
Research report, April 1973. 5 p, 5 fig. OWRT B-050-NJ(1).

Descriptors: *Oxygenation, *Lakes, *Hypolimnion, *Methodology, Eutrophication, Fisheries, Nutrients, Reservoirs, *New Jersey.
Identifiers: *Spruce Run(NJ).

The hypothesis to be tested is that, if the cycle of annual algal growth can once be broken for a two year period, it is probable that in many cases the eutrophication process would be arrested, and in such cases the lake would remain aerobic (oligotrophic) until a surplus nutrient supply is again introduced. The presumption is that by oxygenating the hypolimnion, without destratifying the lake, trout and their food fish can be successfully raised in the lake the year round. The experimental lake is Spruce Run, a water supply reservoir located near Clinton, N.J. on the South Branch of the Raritan River. Year round trout culture in the reservoir is marginal and algal growth is prolific in summer, despite the very high quality of incoming water. Three deep water oxygenators will be installed in a test area and only the hypolimnion will be oxygenated during the summers of 1973 and 1974. Methods are illustrated and described. The reduction in dissolved phosphate due to the oxygenation will be the most direct measure of success of the project. Biological changes will be monitored. (Jones-Wisconsin)
W75-08194

THE CONTRIBUTION OF AGRICULTURE TO EUTROPHICATION OF SWISS WATERS: II. EFFECT OF FERTILIZATION AND SOIL USE ON THE AMOUNT OF NITROGEN AND PHOSPHOROUS IN THE WATER,
Eidgenoessische Forschungsanstalt fuer Agrikulturchemie, Bern.
O. J. Furrer, and R. Gaechter.
Schweiz Z Hydrol. Vol 34, No 1, p 71-93, 1972, Illus.

Descriptors: *Eutrophication, Europe, *Fertilizers, Erosion, Pollutants, *Water pollution sources, *Agricultural chemicals, Agriculture.
Identifiers: *Switzerland.

P and N are the factors responsible for eutrophication. P forms very stable compounds in soil and consequently, only a small quantity is washed away. Fertilization with phosphates seems to have no great influence on the quantity of P eroded. Through superficial erosion, however, an important quantity of P can reach the waters mainly through fertilized and loosened surface soil (crop farming, intensive cultivation). This erosion can be reduced effectively through dense vegetation (green manuring, catch crop fodder-growing, underseeds), through mulching (compost) and through terrace cultivation on slopes. The soil retains a very small quantity of N in the form of nitrates and, consequently, they are easily washed away. The fallow periods are particularly unfavorable when the N present in the soil is not absorbed by plants but almost entirely washed away due to the rainy climate. The judicious use of N as a fertilizer (adequate quantity used at the right time) limits N losses and is therefore of considerable advantage to water pollution control. Based on the information available, a list of measures has been set up to reduce eutrophication due to agriculture.--Copyright 1974, Biological Abstracts, Inc.
W75-08200

FISH PREDATION EFFECTS ON THE SPECIES COMPOSITION OF THE ZOOPLANKTON COMMUNITY IN EIGHT SMALL FOREST LAKES,
Goteborg Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 2H.
W75-08220

THE BACTERIOLOGICAL CONDITIONS OF SOME BELGIAN BEACHES (IN FRENCH),
Institut Royal des Sciences Naturelles de Belgique, Brussels.
For primary bibliographic entry see Field 5B.
W75-08224

THE EPIDEMIOLOGY OF PARASITIC DISEASES FROM AKOSOMBO LAKE (GHANA) AND NASSER LAKE (SUDAN EGYPTIAN NUBIA), (IN FRENCH),
Institut Pasteur, Paris (France). Laboratoire d'Epidemiologie.
R. Deschiens.
Ann Parasitol Hum Comp. Vol 48, No 2, p 243-247, 1973, English summary.

Descriptors: *Lakes, *Diseases, Eutrophication, Tropical regions, Arid lands, Deserts, Humid areas, *Parasitism.
Identifiers: Akosombo Lake, *Egypt, *Ghana, Nasser Lake, Nubia, Onchocerciasis, *Parasitic diseases, Schistosoma-haematobium, Schistosomiasis, Sudan.

A comparative ecological and epidemiological study of parasitic endemic with aquatic vectors in Akosombo Lake (Ghana) and Nasser Lake (Nubia, Egyptian Sudan) demonstrated 2 different aspects of the problem. Akosombo Lake, situated in a warm, damp country, is an eutrophic lacustral system where malaria, bilharziosis and onchocercosis are strongly implanted and yet well con-

trolled. Nasser Lake is situated in an arid, desert area where human density is very low; malaria and onchocercosis exist only potentially and are efficiently controlled, but Schistosoma haematobium is present in 30% of the fishermen.--Copyright 1974, Biological Abstracts, Inc.
W75-08226

SYNERGISM IN THE TOXICITIES OF LEAD AND OXYGEN,
Naval Medical Research Inst., Bethesda, Md.
R. B. Jones, D. P. Nelson, S. Shapiro, and L. A. Kiesow.
Experientia, Vol 30, No 4, p 327-328, 1974. 1 fig, 1 tab, 3 ref.

Descriptors: *Lead, *Oxygen, *Toxicity, Laboratory tests, Laboratory animals, Rodents, Testing procedures.
Identifiers: Synergism.

The administration of lead significantly shortens the survival time of rats exposed to increased partial pressure of oxygen. Under light ether anesthesia femoral cutdowns were performed on male rats weighing 180-220 g, and 20 mg of lead acetate dissolved in 0.5 ml deionized water, or deionized water along was injected i.v. The rats were then placed in specially constructed chambers in groups of 8 each and exposed to 100% oxygen (1 atm) at a flow of 1 l/min. The mean survival time in hours was 29.0 plus or minus and 79.0 plus or minus 15.7 for 3 groups of lead, and 3 groups of non-lead treated rats, respectively (P less than 0.01). No deaths were observed in any animals treated with lead acetate and exposed to air under otherwise identical conditions, nor did the administration of equimolar acetate in the form of the sodium salt have any effect on survival in 100% oxygen. The in vivo toxicity of oxygen at 1 atm has been attributed primarily to pulmonary damage. Under the conditions described, lead and oxygen are capable of acting synergistically to hasten death. The mechanism of this interaction has not been delineated. (Jernigan-Vanderbilt)
W75-08234

DISTRIBUTION OF PLANKTON COMMUNITIES RELATED TO ENVIRONMENTS IN ADJACENT SEAS OF JAPAN: I. PLANKTON OF MIYAKO BAY OF RIKUCHU PROVINCE, (IN JAPANESE),
Tokyo Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 2L.
W75-08239

EPIDEMIOLOGICAL CONSEQUENCES OF VIRUS CONTAMINATION OF WATERS, (IN FRENCH),
Hopital Miletrie, Poitiers (France). Laboratoire C. Nicolle.
F. Denis.
Rev Epidemiol Med Soc Sante Publique, Vol 21, No 4, p 273-302, 1973.

Descriptors: *Water pollution, *Potable water, *Waste water(Pollution), Enteric bacteria, *Viruses, Diseases, Myxobacteria, Public health, Treatment, Waste water treatment, *Water pollution treatment, *Water treatment, Methodology, Water pollution sources, Bibliographies, Reviews.
Identifiers: Adenovirus, Enterovirus, Hepatitis, Myxovirus, Picornavirus, Reovirus.

A general literature-review relative to virus contamination of drinking water and waste waters is presented. Contamination of waters by enteroviruses, reoviruses, myxoviruses, adenoviruses and infectious hepatitis virus; the diseases, particulary the (human) epidemics, that each of these viruses in waters may cause; the process of spontaneous inactivation of viruses in water; and the methods available to treat waters to remove or inactivate the viruses are reviewed.--Copyright 1974, Biological Abstracts, Inc.
W75-08243

THE CHANGES OF BENTHOS IN SLAPY RESERVOIR IN THE YEARS 1960-1961,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Laborator.
For primary bibliographic entry see Field 2H.
W75-08246

SOME PHYSICOCHEMICAL FEATURES OF A MEROMICTIC LAKE SUIGETSU,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2H.
W75-08255

METHEMOGLOBIN LEVELS IN INFANTS IN AN AREA WITH HIGH NITRATE WATER SUPPLY,
California State Dept. of Public Health, Sacramento.
L. A. Shearer, J. R. Goldsmith, C. Young, O. A. Kearns, and B. R. Tamplin.
Am J Public Health, Vol 62, No 9, p 1174-1180, 1972. Illus.
Identifiers: *Bacteria, *Nitrates, *Water supply, *Methemoglobin levels(Human infants), Water pollution effects, Water pollution sources, Public health.

A study of methemoglobin levels in infants from birth through 6 mo. showed that even healthy babies not exposed to excessive nitrate levels in diets have higher levels when young. Babies with diarrhea or respiratory illness had the highest levels in this population. Ingestion of water or formula high in nitrates appears to increase the frequency of elevated methemomoglobin. More than 60% of formulae showed bacterial contamination. Long-term consequences should be investigated.--Copyright 1973, Biological Abstracts, Inc.
W75-08256

ORGANIC SUBSTANCES IN SEDIMENT AND SETTLING MATTER DURING SPRING IN A MEROMICTIC LAKE SUIGETSU,
Nagoya Univ. (Japan). Water Research Lab.
For primary bibliographic entry see Field 2H.
W75-08257

THE EFFECTS OF TEMPERATURE AND RADIATION STRESS ON AN AQUATIC MICROECOSYSTEM,
Virginia Commonwealth Univ., Richmond. Dept. of Biology.
G. L. Samsel, Jr.
Trans Ky Acad Sci, Vol 33, No 1/2, p 1-12, 1972. Illus.
Identifiers: Aquatic life, Cyclops-viridis, Cypris-virens, *Ecosystems, *Radiation stress, *Temperature, *Ostracods, Production, Water pollution effects.

The effects of temperature and ionizing radiation on population density and net production of clonal strains of an ostracod (Cypris virens) and a copepod (Cyclops viridis growing separately and together in aquatic microecosystems were studied. At 10, 20, and 35C, copepods consistently achieved greater adult population densities when accompanied by ostracods. Total net production (all immature forms), adult population densities, and maximum longevities of both crustaceans were greatest at 10C and greater at 20C than at 35C. Three replicates were cultured at 10, 20, and 35C, after exposure to 0, 24, 48, and 96 kR of gamma rays. Adult survival of copepods was unaffected immediately after radiation exposure of 24 and 48 and 96 kR level. Copepod reproduction was inhibited at 16, 24, 48 and 96 kR; but reproduction did occur at 8 kR. The adult population density and life span of the copepod was similar at all radiation levels not exposed to temperature stress. Ostracod survival immediately decreased 7% after exposure to 24 kR, 23% after exposure to 48 kR, and 47% after exposure to 96 kR. Adult population density and net production of both organisms exposed to 24, 48, and 96 kR varied insignificantly when cultured at 20C. Net production, life span, and adult population density or irradiated organisms cultured at 35C were considerably lower than those at 20 or 10C. Net production of irradiated organisms was significantly lower than controls, but varied very little among exposure doses.--Copyright 1973, Biological Abstracts, Inc.
W75-08258

OLIGOTROPHICATION: A SELF-ACCELERATING PROCESS IN LAKES SUBJECTED TO EXCESSIVE SUPPLY OF ACID SUBSTANCES,
Institue for Water and Air Pollution Research, Stockholm (Sweden).
O. Grahn, H. Hultberg, and L. Landner.
Ambio, Vol 3, No 2, p 93-94, 1974. Illus.
Identifiers: *Acids, Lakes, *Oligotrophication, Hydrogen ion concentration, Eutrophication, Ecosystems.

The dynamics of the ecosystems of acidified lakes were investigated by integrated studies directed at all trophic levels in 6 acid lakes with pH values between 4.4 and 5.4. The primary biological effects on individuals and populations of a continuous supply of acid substances to a lake may induce profound, long-term changes, forcing the lake into an increasingly more oligotrophic state. This general oligotrophication of lakes tends-by means of a feedback mechanism-to further accelerate the process of acidification.--Copyright 1974, Biological Abstracts, Inc.
W75-08262

RATES OF OXYGEN UPTAKE BY THE PLANKTONIC COMMUNITY OF A SHALLOW EQUATORIAL LAKE (LAKE GEORGE, UGANDA),
Vienna Univ. (Austria). Limnologische Lehrkanzel.
G. G. Ganf.
Oecologia (Berl), Vol 15, No 1, p 17-32, 1974. Illus.
Identifiers: Algae, Bacteria, Equatorial lakes, Lakes, *Oxygen absorption(Plankton), Photosynthesis, Phytoplankton, Planktonic communities, Respiration, *Uganda(Lake George), Zooplankton, Shallow lakes.

Community respiration rates of the plankton in the upper meter of a shallow equatorial lake (Lake George, Uganda) show diurnal fluctuations within the range 1-4.5 mg O2/mg chlorophyll a h. In the deeper water, below the euphotic zone, rates show less variation and approximate a value of 1 mg O2/mg chl a h. Comparative field and laboratory measurements of the relationship between community respiration and temperature indicate that the dirunal variation observed is not a simple function of temperature variation. Field measurements suggest that the rate of community respiration tends to increase, in a non-linear manner, as the daily cumulative photosynthesis/unit population increases. A series of laboratory experiments are described which attempt to fractionate, by chemical means, the O2 uptake due to phytoplankton, bacteria and zooplankton. Although the results were variable they indicate that somewhere between 10 and 50% of the total O2 uptake is due non-algal material. The influence of these findings on calculations of net daily photosynthesis is discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-08263

SEASONAL FLUCTUATIONS OF THE MEIOBENTHOS IN AN ESTUARY ON THE SWEDISH WEST COAST,
Uppsala Univ. (Sweden). Inst. of Zoology.
K.-G. Nyholm, and I. Olsson.
Zoon, Vol 1, No 1, p 69-76, 1973, Illus.

Descriptors: *Benthos, *Coasts, Europe, *Estuaries, Sewage, Pollution, Water pollution, *Organic wastes, Waste water, Ecosystems.

Identifiers: Cyclopidea, Foraminifera, Halacarida, Harpacticoidea, Hydroidea, Kinorhyncha, *Meiobenthos, Nematoda, Ostracoda, *Sweden.

The investigation was carried out 1961-65 in the inner part of the Kungsbackafjorden, an estuary on the Swedish west coast in a region where an increase of sewage can be expected. Samples were taken on 9 occasions during about 1 yr in order to study the hydrography and the meiobenthos (0.2-2 mm) at 3 localities at 3, 4 and 16 m. The salinity may in all cases be classified as polyhalin. At the deeper station more decomposed organic debris is accumulated and here the content of organic C is very high. The O2 content of the bottom water is not a critical factor but saturation values below 50% were intermittently obtained. The meiobenthos samples were taken with a 'Bodensauger' (100cm2) and only the upper-most cm of the sediment was studied. Meiobenthos ranged from 4000-150,000/m2 in number of individuals and from 0.002-0.7 g/m2 in wet weight. Maximum abundances were obtained in the autumn. The following groups were included: Foraminifera, Hydroidea, Nematoda, Kinorhyncha, Ostracoda, Harpacticoidea, Cyclopidea and Halacarida. All the data concerning these faunal groups were statistically treated by analysis of variance. The data of the 2 shallower stations were compared with regard to both time and space and the interaction effect of these quantities was examined. The comparison between localities gave significant differences for monothalamous foraminifers, Rotaliidae, Ostracoda and Harpacticoidea. With regard to time, there were significant differences for all groups except Hydroidea and Kinorhyncha. As to the deepest station, with regard to time, there were significant differences for monothalamous foraminifers, Nematoda, Kinorhyncha and Harpacticoidea. The pattern in the quantitative fluctuations of the group. Kinorhyncha was very similar to that of Nematoda, which indicates an important role in the estuarine ecosystem for the former group.--Copyright 1974, Biological Abstracts, Inc.
W75-08271

NATURAL RESOURCES IN MODERN WORLD AND THE PROBLEM OF THEIR CONSERVATION, (IN ROMANIAN),
Academia R. S. R., Cluj. Centrul de Cercetari Biologice.
For primary bibliographic entry see Field 6G.
W75-08274

THE ROLE OF TRACE ELEMENTS IN MANAGEMENT OF NUISANCE GROWTHS,
Academy of Natural Sciences of Philadelphia, Pa.
For primary bibliographic entry see Field 5G.
W75-08278

MODELING DYNAMICS OF BIOLOGICAL AND CHEMICAL COMPONENTS OF AQUATIC ECOSYSTEMS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
R. R. Lassiter.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 987, $4.25 in paper copy, $2.25 in microfiche. Report EPA-660/3-75-012, May, 1975. 54 p, 11 fig, 43 ref. 1BA023.

Descriptors: *Simulation analysis, Photosynthesis, *Growth rates, Phytoplankton, Zooplankton, *Ecosystems, Water chemistry, *Model studies, Nitrogen cycle, Computer models, Limnology, Algae.
Identifiers: Predator-prey models, Inhibition models, Microbial growth rate, Algal growth rate, *Aquatic ecosystem models, Temperature related growth.

To provide capability to model aquatic ecosystems or their sub-systems as needed for particular research goals, a modeling strategy was developed. Submodels of several processes common to aquatic ecosystems were developed or adapted from previously existing ones. Included are submodels for photosynthesis as a function of light and depth, biological growth rates as a function of temperature, dynamic chemical equilibrium, feeding and growth, and various types of losses to biological populations. These submodels may be used as modules in the construction of models of subsystems or ecosystems. A preliminary model for the nitrogen cycle subsystem was developed using the modeling strategy and applicable submodels. (EPA)
W75-08279

A REVIEW OF THE LITERATURE ON THE USE OF BAYLUSCIDE IN FISHERIES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
S. E. Hamilton.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 441, $4.25 in paper copy, $2.25 in microfiche. National Marine Fisheries Service, July 1974. 54 p, 1 tab, 114 ref.

Descriptors: *Reviews, *Pest control, *Pesticides, *Lamphreys, Bibliographies, Freshwater fish, Fisheries, Surveys, Sport fish, Mode of Action, Toxicity.
Identifiers: *Bayluscide, *Lampricides.

A review of the literature on the uses and applications of Bayluscide is presented. Bayluscide has been tested against freshwater snails and has been used in field trials as a fish toxicant. In the 5% granular formation, Bayluscide has been used since 1966 to survey populations of larval sea lampreys in Great Lakes estuaries and deepwater tributaries. At present, in the United States, the registration restricts use to population surveys only. (Katz)
W75-08303

BEHAVIOR OF ULTRASONIC TAGGED CHINOOK SALMON AND STEELHEAD TROUT MIGRATING PAST HANFORD THERMAL DISCHARGES(1967),
Battelle-Pacific Northwest Labs., Richland, Wash.
C. C. Coutant.
Available from the National Technical Information Service, Springfield, Va. 22161, as BNWL-1530, $4.00 in paper copy, $2.25 in microfiche. Report BNWL-1530, prepared for the US Atomic Energy Commission, under Contract AT (45-1): 1830, July 1973. 15 p, 2 tab, 5 fig, 11 ref.

Descriptors: *Thermal pollution, *Fish behavior, *Trout, *Migration, *Chinook Salmon, Aquatic environment, Fish migration, Columbia River, Tracking techniques, Temperature, Nuclear reactors, Movement.
Identifiers: *Oncorhynchus tshawytscha, *Steelhead trout.

Ultransonic tagged, adult chinook and steelhead were tracked in 1967 during upstream migration past cooling water discharges from nuclear reactors. All fish migrated near shorelines, showing preference for the river bank opposite reactors. Clear responses to local temperature differences were exhibited by few fish, these responses being to small shoreline seepages rather than to main center-channel outfalls. (Katz)
W75-08304

MAMMALIAN TOXICOLOGY AND TOXICITY TO AQUATIC ORGANISMS OF WHITE PHOSPHORUS AND 'PHOSSY WATER", A WATERBORNE MUNITIONS MANUFACTURING WASTE POLLUTANT - A LITERATURE EVALUATION FINAL COMPREHENSIVE REPORT,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
D. Burrows, and J. C. Dacre.
Available from the National Technical Information Service, Springfield, Va. 22161, as AD-777 901, $3.75 in paper copy, $2.25 in microfiche. Report to US Army Medical Research and Development Command, Washington, DC, 20315, November 1973. 50 p, 1 fig, 7 tab, 189 ref.

Descriptors: *Phosphorus, *Toxicity, *Lethal limit, *Reviews, Fish, Molluscs, Lobsters, Mortality, Water pollution sources, Pollutants, Aquatic life.
Identifiers: Phossy water, Phosphine, Munitions.

A review of the literature on the toxicology and toxicity of white phosphorus is presented. Elemental white phosphorus is highly toxic to experimental animals and man causing gastrointestinal irritation, liver damage and eventual coma, convulsions and death. The fatal dose for man is about 1-1.4 mg/kg. Biochemical studies are reported and summarized. White phosphorus is also highly toxic to aquatic animals. The 96 hr LC50's are less than 50 ppb for all fish studied, and the incipient lethal level is probably less than 1 ppb for most fish. Crustaceans and many molluscs are more tolerant, but still succumb to phosphorus concentrations of 1 ppm or less. Phosphorus poisoning appears to be cumulative and irreversible for fish and lobsters. The cause of mortality in fish has not been determined. Recommendations for studies on white phosphorus and phossy water in experimental animals and in wastewaters are outlined. (Katz)
W75-08305

A REVIEW OF THE LITERATURE ON THE USE OF ANTIMYCIN IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
R. A. Schnick.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 440, $4.75 in paper copy, $2.25 in microfiche. April 1974. 85 p, 5 tab, 70 ref.

Descriptors: *Pesticides, *Piscicides, Antibiotics(Pesticides), *Pest control, *Reviews, *Antimycin A, *Aquiculture, Fishes, Freshwater fish, Mode of action, Toxicity.

Literature on the use of antimycin in fisheries in reviewed. Antimycin can be used very selectively, and can be detoxified by potassium permanganate or chlorine. Piscicidal concentrations of antimycin are relatively harmless to other aquatic life. However, on-site bioassays should be conducted to ensure that an overdose of antimycin is not applied. A sensitive assay method is available for determining levels in the water and current research may soon provide a sensitive method for tissues. (Katz)
W75-08306

THE CHEMICAL ECOLOGY OF COPEPOD DISTRIBUTION IN THE LAKES OF EAST AND CENTRAL AFRICA,
Duke Univ., Durham, N.C. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W75-08321

STRATIGRAPHIC EFFECTS OF TUBIFICIDS IN PROFUNDAL LAKE SEDIMENTS,
Maine Univ., Orono. Dept. of Botany and Plant Pathology.
R. B. Davis.
Limnol Oceanogr, Vol 19, No 3, p 466-488, 1974, Illus.
Identifiers: Alimentation, Feces, Lakes, Limnodrilus, Mathematical models, Pollen, Sediments, *Stratigraphic effects, *Tubificids, *Lake sediments(Profundal), *Maine(Messalonskee Lake).

Experiments conducted with natural mixed populations of 800 and 1800 tubificids (Limnodrilus) m to minus 2 power in sediment from Messalonskee Lake, Maine, showed average sediment transport by alimentation at 10C 2-3 times greater than highest rates previously reported. More than 95% of feeding on introduced pollen was at depths above 7 cm, with greatest feeding at 3-4 cm. Small amounts of pollen were raised to the surface from as deep as 15 cm. Downward transport was 14 and 19% of upward. Small pollen grains (< 40 micrometers) were fed upon and displaced at higher rates than large grains. Organic matter was less in the surface layer of feces than in sediment from feeding depths and in surface sediment where no worms were present. A mathematical model was used to appraise the stratigraphic effects of the worms by deriving age-frequency composition of sediment at various depths.--Copyright 1974, Biological Abstracts, Inc.
W75-08322

THE EFFECTS OF DISSOLVED ZINC ON THE GILLS OF THE STICKLEBACK GASTEROSTEUS ACULEATUS (L.),
Queen Elizabeth Coll., London (England). Dept. of Biology.
P. Matthiessen, and A. E. Brafield.
J Fish Biol, Vol 5, No 5, p 607-613, 1973, Illus.
Identifiers: Cytoplasmic, Excretion, Gasterosteus-aculeatus, Gills, Ions, Pollution, *Stickleback, Water pollution effects, *Zinc(Dissolved).

Concentrations of 0.5-1.0 mg Zn2+/dm3 distilled water killed sticklebacks after 103 days, producing detachment and sloughing of epithelial cells and coalescing of adjacent secondary lamellar epithelia. Cytoplasmic abnormalities included extensive vacuolation, followed by swelling of nuclei and mitochondria leading to cellular disintegration. Many acutely poisoned fish recovered in Zn-free hard water, regeneration of epithelia being accompanied by a temporary appearance of chloride cells on the secondary lamellae. Concentrations of 2.0-6.0 mg Zn2+/dm3 hard water were not toxic over periods of up to 600 h. Extensive cytoplasmic abnormalities appeared including the formation of membrane-bound vesicles and dense accumulations of metabolites. The most pronounced effect was the appearance of active chloride cells on the secondary lamellae. The possible involvement of chloride cells in the excretion of ions other than Cl- is briefly discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-08327

STUDIES ON UPTAKE AND LOSS OF METHYLMERCURY-203 BY BLUEGILLS (LEPOMIS MACROCHIRUS RAF.),
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
W. D. Burrows, and P. A. Krenkel.
Environ Sci Technol, Vol 7, No 13, p 1127-1130, 1973, Illus.
Identifiers: *Bluegills, Kidney, Lepomis-macrochirus, Liver, *Mercury-203, *Methylmercury, Pollution, Water pollution effects, Absorption.

The uptake of methylmercury-203 directly from water by bluegills was nearly constant after 5 days at about 20%/g of fish/l of water. Transferred to Hg-free water at 24C, bluegills exhibited a rapid loss of about 40% of the Hg, followed by a slow loss with a half-time of about 5 mo. Hg levels in the liver and kidneys were 2-7 times higher than whole fish levels, but there was no discernible trend in this ratio with time. The proportion of Hg present as methylmercury in the whole remained at 73 plus or minus 10% throughout the course of the experiment. The proportion of methylmercury in the liver and kidneys fell rapidly in the 1st few weeks after exposure, ultimately leveling off at about 10%. This suggests that biochemical demethylation is taking place in these organs.--Copyright 1974, Biological Abstracts, Inc.
W75-08328

URBANIZATION AND THE MICROBIAL CONTENT OF THE NORTH SASKATCHEWAN RIVER,
Alberta Univ., Edmonton. Dept. of Microbiology.
R. N. Coleman, J. N. Campbell, F. D. Cook, and D. W. S. Westlake.
Appl Microbiol, Vol 27, No 1, p 93-101, 1974, Illus.

Descriptors: *Urbanization, Rivers, *Microorganisms, Bacteria, *Canada, E. coli.
Identifiers: Salmonella, *North Saskatchewan River.

The effect of urbanization on the microbial content of the North Saskatchewan River, Canada was determined by following the changes in the numbers of total bacteria, total eosin methylene blue (EMB) plate count, and Escherichia coli as the river flowed from its glacial source, through parklands, and out into the prairies. Changes in physical parameters such as pH, temperature, salt concentration, and the amount and nature of the suspended material were also determined to evaluate their effect on the microbial parameters being measured. The level of all 3 microbial parameters studied slowly increased as the river flowed from its glacial source out into the prairies. The major effect of small hamlets, with or without sewage treatment facilities, is to supply nutrients which supports the growth of the indigenous river flora but not E. coli. In contrast, the effect of a large urban center, with a population of approximately 500,000 which utilizes primary and secondary sewage processes in disposing of sewage, is to provide the nutrients and an inoculum of E. coli which results in a marked increase in the numbers of all 3 microbial groups studied. The effect of this urban center was still discernible 300 miles downstream. The river was also monitored for the presence of Salmonella sp. Only 1 positive isolation was achieved during this study, and this isolate was characterized as being Salmonella alachua.--Copyright 1974, Biological Abstracts, Inc.
W75-08329

ACCUMULATION, RELEASE AND RETENTION OF PETROLEUM HYDROCARBONS BY THE OYSTER CRASSOSTREA VIRGINICA,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
J. J. Stegeman, and J. M. Teal.
Mar Biol (Berl). Vol 22, No 1, p 37-44, 1973, Illus.
Identifiers: Carbons, Chromatography, Crassostrea-virginica, *Oysters, Petroleum, *Petroleum hydrocarbons, Absorption, Water pollution effects.

Two C. virginica populations, differing in fat content, were experimentally exposed to a complex petroleum-hydrocarbon fraction. The hydrocarbons in this mixture were accumulated by both groups of oysters and their lipid content, as well as the concentration of hydrocarbon in the water, affected the rate and extent of accumulation. Hydrocarbons accumulated were rapidly, although incompletely, discharged when the oysters were transferred to an uncontaminated system. Amounts of hydrocarbons discharged and amounts retained after discharge are probably related to the level of contamination. The data indicate that equilibration and the occurrence of multiple compartments where hydrocarbons can reside are factors involved in the uptake and retention of nonbiogenic hydrocarbons by oysters. The petroleum hydrocarbons contained in the oysters differed from the contaminating oil by displaying a greater aromatic content. In addition, gas-liquid chromatograms of aliphatic fractions of the hydrocarbons in the oysters rapidly showed a degraded appearance. The oysters themselves may modify the oil.--Copyright 1974, Biological Abstracts, Inc.
W75-08331

EFFECTS OF WATER HARDNESS ON THE TOXICITY OF SEVERAL ORGANIC AND INORGANIC HERBICIDES TO FISH,
A. Inglis, and E. L. Davis.
US Bur Sport Fish Wildl Tech Pap. 67, p 1-22, 1972, Illus.
Identifiers: Arsenite, Black, Bluegills, Bullheads, Copper sulfate, Dichlobenil, Endothall, Fish, Goldfish, Hardness, *Herbicides, Inorganic pesticides, Organic pesticides, Phenol, Rainbow trout, Redear, Silvex, Sodium, Sunfish, *Toxicity, *Water hardness, *Bioassay, Calcium carbonate, Water pollution effects.

Effects of water hardness on the acute toxicity of organic and inorganic herbicides were determined in static bioassays. Concentrations of total hardness (calculated as CaCO3) of 13.0, 52.2, 208.7, and 365.2 ppm were tested in water containing Ca/Mg ion ratios of 1:1 and 5:1. Bluegills were the principal test species; rainbow trout, bluespotted sunfish, goldfish, redear sunfish, and black bullheads were also tested. Organic herbicides tested included 3 formulations of 2,4-D (butoxy ethanol ester (BEE), propylene glycol butyl ether ester (PGBEE), dimethylamine salt (DMS)), 3 formulations of endothall (Na salt, and 2 dimethylalkylamine derivatives), and 1 formulation each of silvex (BEE), pentachlorophenol, and dichlobenil; inorganic herbicides included technical grades of sodium arsenite and CuSO4. Hardness had no significant effect on toxicity of the organic herbicides or that of sodium arsenite; the toxicity of copper sulfate decreased in the harder waters. The significance of the results is discussed.--Copyright 1974, Biological Abstracts, Inc.
W75-08332

STUDIES ON THE SKIN OF PLAICE (PLEURONECTES PLATESSA L.). III. THE EFFECT OF TEMPERATURE ON THE INFLAMMATORY RESPONSE TO THE METACERCARIAE OF CRYPTOCOTYL LINGUA (CREPLIN, 1825) (DIGENEA:HETEROPHYIDAE),
Glasgow Univ. (Scotland). Dept. of Dermatology.
A. McQueen, K. MacKenzie, R. J. Roberts, and H. Young.
J Fish Biol, Vol 5, No 2, p 241-247, 1973, Illus.
Identifiers: *Bacteria, *Cryptocotyle-lingua, Digenea, Fibrillar, Heterophyidae, Inflammatory, *Metacercariae, Necrosis, *Plaice, Pleuronectes-platessa, Skin, Temperature.

O-group plaice (89) from a natural population were exposed at 15C to heavy infection by C. lingua cercariae. Subsequently 45 fish were retained at 15C, while 44 were held at 5C. Both groups were sample by killing individual fish at intervals of 6, 18, 42 h and daily thereafter up to 710 h. Entire fish were fixed immediately in formol saline, transversely sectioned and stained by H and E (hematoxylin eosin), PAS (Periodic-acid Schiff), PAS-diastase, JSDB 109, Picro-Mallory, Masson's trichrome, Gram-Weigert and Alcian blue. Histopathological observations showed: epidermal lesions associated with encysted metacercariae in adjacent tissues; myofibrillar necrosis associated with bacteria possibly introduced by the parasite and a reactive swelling of the intermuscular septa. The progressive development of the parasite cyst and host capsule is described. Development of both was markedly inhibited at the lower temperature, but the inflammatory response at either temperature was slight. This may be evidence of a long-standing host-parasite relationship which has evolved to an advanced state of adaptation on the part of the parasite and tolerance on the part of the host.--Copyright 1973, Biological Abstracts, Inc.
W75-08334

TUBERCULOSIS OF FISH AND OTHER HETEROTHERMIC VERTEBRATES (IN POLISH),
Polskie Towarzystwo Nauk Weterynaryjnych, Warsaw (Poland).
Z. Jara.

Med Weter, Vol 28, No 12, p 705-710, 1972. Illus.

Descriptors: *Fish diseases, Fish diets, Amphibians, Reptiles.
Identifiers: *Heterothermic vertebrates, Mycobacterium, *Tuberculosis.

Tuberculosis in fish was described for the 1st time in carp in 1897. It was thought at the time that a new type of tuberculosis was discovered. Since then tuberculosis symptoms were found in 151 spp. of fish, 11 spp. of amphibians and 23 spp. of reptiles. Fish are usually infected through feed. The disease in general develops slowly, the only external symptoms being loss of weight at times accompanied by changes on the skin consisting of paleness, loss of scales and injury of fins. Treatment is difficult and only prophylactic measures can be recommended. Several types of Mycobacterium infecting fish were distinguished. Tubercular infection in amphibians and reptiles is noted.--Copyright 1974, Biological Abstracts, Inc.
W75-08346

PARASITES OF THE NINE-SPINED STICKLEBACK PUNGITIUS PUNGITIUS (L.),
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
H. J. G. Dartnall.
J Fish Biol, Vol 5, No 4, p 505-509, 1973. Illus.

Descriptors: *Parasitism, Europe, Water pollution sources, Pollutants, *Sticklebacks, Fish, Fish diseases, *Fish parasites, *Animal parasites.
Identifiers: Anodonta-cygnea, Cryptocotyle-lingua, Diplostomum-spathaceum, Epistylis, Gyrodactylus-spp, Proteocephalus-filicollis, Pungitius-pungitius, Schistocephalus-solidus, Thersitina-gasterostei, Trichodina-domerguei, Trichodina-tenuidens, Vorticella-sp, Great Britain.

Eleven species of parasite are reported from the nine-spined stickleback P. pungitius. Of these, Trichodina domerguei, T. tenuidens, Vorticella sp., Epistylis, Diplostomum spathaceum, Cryptocotyle lingua, Proteocephalus filicollis, Schistocephalus solidus and glochidia of Anodonta cygnea, are new host records for Great Britain. Gyrodactylus spp. and Thersitina gasterostei were also found.--Copyright 1974, Biological Abstracts, Inc.
W75-08347

5D. Waste Treatment Processes

PROCEEDINGS OF THE SEMINAR ON ADVANCED WASTEWATER TREATMENT AND DISPOSAL,
Nassau-Suffolk Regional Planning Board, N. Y. Regional Marine Resources Council
Held on June 10, 1971 at Hauppauge, N.Y., (1972) 167 p.

Descriptors: *Waste water treatment, *New York, *Tertiary treatment, *Waste water disposal, Waste disposal, Management, Groundwater, Water pollution, Regional analysis, Water quality control, Water reuse, Recycling, Reviews, Irrigation, Water pollution sources, Path of pollutants.
Identifiers: *Long Island(NY), Nassau-Suffolk region(NY).

The seminar was intended to present current views and experience in wastewater-groundwater management to those persons responsible for developing public policy decisions in the Nassau-Suffolk region. The program was not designed for general public information, but rater as an exchange of ideas and expertise for administrators charged with the responsibility of managing water resources. One of the major problems identified by the Regional Marine Resources Council (MRC) of the Nassau-Suffolk Regional Planning Board is the treatment and disposal of wastewater and groundwater management. These problems are part of the MRC's ongoing research activities funded by both the National Sea Grant Program and the Nassau-Suffolk Regional Planning Board. (See W75-07955 thru W75-07961)
W75-07954

THE LONG ISLAND WATER SITUATION,
Geological Survey, Mineola, N.Y. Water Resources Div.
For primary bibliographic entry see Field 5B.
W75-07955

STATUS OF ADVANCED WASTE TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
I. J. Kugelman.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10, 1971 at Hauppauge, N.Y. p 19-98, (1972) 25 fig, 34 tab, 59 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Sewage treatment, *Waste treatment, Sanitary engineering, Aeration, Coagulation, Filtration, Flocculation, Oxidation, Reverse osmosis, Activated carbon, Sewage effluents, Organic matter, Pollutants, Denitrification, Biological treatment, *Tertiary treatment, Separation techniques.

Advanced wastewater treatment techniques are described with emphasis on those ready for full-scale engineering application. Six major contaminants which exist at presently measurable levels are discussed: suspended solids, organics, (biological oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC)), phosphorous compounds, nitrogen compounds, microorganisms, and salts. Although conventional primary plus secondary treatment removes suspended solids, biodegradable organics, and microorganisms from wastewater, it is no longer sufficient with rising water quality standards and increasing generation of contaminants. Performance can be upgraded, especially in the removal of suspended solids and BOD, with biological-physical treatments including microstainers and deep bed filtration. Chemical coagulants can cause flocculation into removable particles. But to remove phosphorous, nitrogen, organic carbon, or TDS (total dissolved salts) requires additional processes. Phosphorous can be removed by adding iron or aluminum salts or lime. Nitrogen, particularly organic-N and ammonia-N, exert BOD (biological oxygen demand) on receiving waters unless biologically mediated oxidation reactions are used to change them to nitrate-N or nitrite-N. Ammonia-N can also be removed by ion exchange, air stripping, or a breakpoint chlorination process. Refractory organics, not removed by other processes, can be removed with activated carbon, ozonation, or pure oxygen activated sludge treatment. Reverse osmosis, still experimental, may someday remove virtually all TDS as well as every other pollutant. Cost functions and experimental results are given. (See also W75-07954) (Herr-North Carolina)
W75-07956

THE STATUS OF WASTEWATER TREATMENT ON LONG ISLAND,
Suffolk County Dept. of Environmental Control, N.Y.
J. Flynn.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10, 1971 at Hauppauge, N.Y. p 99-104, (1972).

Descriptors: *Waste water treatment, *Municipal wastes, *Sewage treatment, Waste treatment, *Water quality, Groundwater recharge, Groundwater availability, Water table, Groundwater movement, Groundwater, Saline water intrusion, *New York.
Identifiers: *Suffold County(NY), Nassau County(NY).

The wastewater treatment systems of Suffolk County, New York are compared to those of neighboring Nassau County. Nassau is now sewering 55 to 60 percent of its population, and expects to be serving over 85 percent by the year 2000. Suffolk has had difficulty passing the required referendum measures and is now sewering only 7 percent. The Southwest Sewer District, approved in 1969, will serve 25 to 30 percent of the population when completed. Suffolk's 1970 Subdivision Program will also require developers to either construct sewers and sewage plants to county specifications, install sewers (in additional to cesspools) for later connection to a sewage plant, or contribute per lot toward eventual plant construction. The groundwater level must be maintained to prevent salt water instrusion at the coastline and maintain the flow of freshwater streams. Groundwater recharge in the past has been increased by the county's 300,000 cesspools. A less polluted source of recharge using communal wastewater systems instead of individual systems must be developed, though it will be costly and inconvenient to construct. Consultants are currently studying the types of waste treatment, the levels of treatment, and the timing and location of recharge that will be rquired to maintain groundwater levels and quality. (See also W75-07954) (Herr-North Carolina)
W75-07957

WASTEWATER USE AND GROUNDWATER RECHARGE IN LOS ANGELES COUNTY,
Los Angeles County Flood Control District, Calif.
A. E. Bruington.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10, 1971 at Hauppauge, N.Y., p 105-127, (1972) 12 fig.

Descriptors: Water resource development, *Groundwater barriers, *Groundwater recharge, *Recharge wells, *Water reuse, *Saline water intrusion, Artificial recharge, Water wells, Groundwater resources, Water sources, Water table, Injection wells, Recharge ponds, Groundwater movement, Groundwater, *California.
Identifiers: *Los AngelesCounty(Calif), West Coast Basin Barrier Project.

Injection well groundwater recharge of the West Coast Basin Barrier Project, in operation for over ten years, has successfully halted saltwater intrusion into the water table in Los Angeles County. Paralleling the Coast at an average distance of 30 miles is a mountain range which receives 40 inches of rain per year while the coast averages 9 inches. Runoff from the mountains enters the very large groundwater basin of the coastal plain composed of accumulated marine sediments. In spite of water imported from the Colorado River, the county continues to depend on groundwater for about one third of its supply. Artificial spreading basins formed on flat land and in river beds to increase groundwater recharge tend to become clogged with silt and recharge at very slow rates. The nine mile long row of 97 wells at the coastline has been more successful. Injection of 35,000 acre feet of Colorado River industrial and commercial water per year has raised the groundwater surface, forming a ridge which salt water won't penetrate. Experiments with thoroughly treated wastewater injection show no transfer of virus to test wells only 20 feet away. Biological oxygen demand (BOD) is not a problem if the water is injected with oxygen. Costs are competitive with Colorado River water. Reclaimed water hasn't been used on a large scale due to potential hazards from exotic new chemical wastes, capital outlay costs, and public opinion. (See also W75-07954) (Herr-North Carolina)
W75-07958

SPRINKLER IRRIGATION FOR LIQUID WASTE DISPOSAL,
Pennsylvania State Univ., University Park.
E. A. Myers.
In: Proccedings of the Seminar on Advanced Wastewater Treatment and Dispoal, June 10, 1971, at Hauppauge, N.Y., p 129-141, (1972) 1 fig, 9 ref.

Descriptors: *Groundwater recharge, *Irrigation engineering, *Water reuse, *Water spreading, *Waste water treatment, Irrigation, Irrigation design, Artificial recharge, Waste disposal, Waste assimilative capacity.
Identifiers: Center pivot and traveler irrigation, Solid-set irrigation, Wastewater renovation-conservation concept.

There is increasing acceptance of the use of land irrigation for final disposal of municipal and industrial effluent after primary and secondary treatment and chlorination. The renovation-conservation concept involves return, renovation, recharge, and reuse of water. After considering soil type and current water content, treated water is returned to the soil over a wide area in a properly timed sequence. As it percolates through the soil profile the nutrients are chemically fixed in the soil and the water is naturally renovated. The water is then recharged into the groundwater supply. Both water and nutrients are then available for reuse; the water by man and the hydrologic cycle, the nutrients by plants grown on the soil. When the plants are harvested the nutrients are removed in them so that the soil's capacity to renovate water continues. The basic objective of the system is to add as much water to the land as possible while maintaining thorough renovation so that water below a depth of four feet is potable. Water should be applied at a rate between 1/8 and 1/4 inch per hour, depending on soil, season, and type of waste. Municipal wastes should be applied at an average of 100 inches per year, while some industrial and cannery wastes, containing only organic matter, may be applied much more rapidly. Because these water applications are not always consistent with good agricultural practices, municipalities or industries should own their irrigation land. Costs of Installing a solid-set system average from $2500 to $4000 per acre. Travelers and center pivot irrigation systems, if appropriate, are considerably less expensive to install but operating costs are somewhat higher and wind drift can be a nuisance. (See also W75-07954) (Herr-North Carolina)
W75-07959

MUSKEGON, MICHIGAN,
Chicago Univ., Ill. Center for Urban Studies.
J. R. Sheaffer.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10. 1971 at Hauppauge, N.Y., p 145-160, (1972) 2 fig, 1 tab.

Descriptors: *Waste water treatment, *Tertiary treatment, *Irrigation design, *Water reuse, *Irrigation parctices, Artificial recharge, Water quality, Groundwater recharge, Waste disposal, Water spreading, Water purification, *Michigan.
Identifiers: *Muskegon County(Mich).

The Muskegon County National Pilot Program utilizes a 6-element effluent irrigation system to provide low cost tertiary treatment with significant benefits. Raw sewage is transported 15 miles inland, processed in aerated treatment cells, and transformed to an odorless liquid. Capacity has been developed to store this secondary treatment liquid for up to 150 days. Before being sprayed on 6000 acres of agricultural land it is chlorinated and dechlorinated. Percolation through the aerobic soil zone provides the equivalent of tertiary treatment. Reclaimed water flows to the monitoring sites along a complete system of drainage wells and drainage tiles. Reliability is increased by flexibility at several points. Treatment cells can be operated in series or parallel, handling shock loads more easily than conventional physical-chemical treatment plants. Blowing vapor from spray irrigation is minimized by holding water during cold and rainy times and using pivot irrigation where effluent can be delivered downward from overhead pipes in large droplet size. Operation and maintenance costs are about 9 cents/1000 gallons, compared to 17 cents/1000 gallons in comparable activated sludge secondary treatment plants. Counting the costs of 10,000 acres of land acquisition, the cost will still be less than traditional treatment: $37.72 compared to $48.25 per year for a family of four. Income from crop yield will offset these costs. Additional benefits include removal of treatment plants from urban locations, planned permanent agricultural land which could be positioned as a greenbelt, and additional land between irrigation rings which could be used for sanitary landfill. (See also W75-07954) (Herr-North Carolina)
W75-07960

WASTEWATER MANAGEMENT ACTIVITIES AT THE BROOKHAVEN NATIONAL LABORATORY,
Brookhaven National Lab., Upton, N.Y.
M. M. Small.
In: Proceedings of the Seminar on Advanced Wastewater Treatment and Disposal, June 10, 1971, at Hauppauge, N.Y., p 160-167, (1972).

Descriptors: *Waste water treatment, *Aeral hydrology, Water resources development, *Sewage treatment, *Computer simulation, Groundwater resources, Pollutants, Landfills, Nuclear wastes, Groundwater movement, Water level fluctuations, Water sources, Groundwater, Aquifer characteristics, *New York.
Identifiers: Long Island(NY).

Brookhaven National Laboratory on Long Island would be an excellent site for exploration of wastewater recharge problems. Located on 5,200 acres with 2500 resident employees, it is a microcosm of all of Nassau and Suffolk Counties in terms of waste-water treatment. All variations of geological, geographical, topological, and ecological contrasts of the counties are represented. There is already in operation a 3 mgd (million gallons per day) water treatment plant for removal or iron from water supplied to the domestic distribution system. Total well pump capacity is 12 mgd. The Laboratory's sewage treatment plant is capable of providing secondary treatment to 3 mgd and has 20 acres of sand filtration beds which could be modified for experiments with settling lagoons and filtering media. The Laboratory is also developing a computer assisted hydrological model to show rates, quantities, and directions of flow in the underlying aquifers so that changes in hydrology due to Laboratory withdrawal and recharge can be predicted. Sixty sampling wells are already in operation and additional ones will be drilled to study underground migration of water and contaminants. Areas to study include groundwater around the sewage treatment plant, an old burning dump, a sanitary landfill, and radioactive materials processing areas. Data from these wells will assist in developing a prototype model which could be expanded into a long-term water use and reuse predictive model for the entire island, an invaluable engineering planning tool for the future management of water use and recharge facilities of Long Island. (See also W75-07954) (Herr-North Carolina)
W75-07961

HIGH-OXYGEN TREATMENT OF WASTE WITH SELECTIVE OXYGEN RECIRCULATION,
Chicago Bridge and Iron Co., Aurora, Ill. (assignee)
J. D. Walker.
U.S. Patent No 3,872,003, 7 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 932, No 3, p 1075, March 18, 1975.

Descriptors: *Patents, *Waste water treatment, *Oxygenation, *Water pollution control, *Pollution abatement, Bubbles, Dissolved oxygen, Water quality control.

The method of treating waste liquid with gas richer than air in oxygen includes flowing the waste liquid through a retention tank. A gas-lift rolling action of the tank contents is maintained with the gas-lifted contents forming a horizontal stream flowing away from the gas-lift zone in surface-exposed position by liberating and allowing to rise immediately by buoyancy the gas at submerged locations along selected zones of the tank. A small portion of its total horizontal cross section holds sufficient quantities to create and maintain the rolling action and thereby cause the contents to carry small entrained bubbles to remote areas. Oxygen from a source of nearly pure oxygen is constantly added to the repumped gas. The quantity of this enrichment is determined automatically, in response to a meter determining the dissolved oxygen content in the tank liquid, to supply just the amount neede to maintain a desired dissolved oxygen content. In some forms of the invention the waste liquid to be treated flows through successive isolated or semi-isolated cells, and the oxygen enrichment supplied to each cell is automatically regulated to provide the desired oxygen content of that cell. (Sinha-OEIS)
W75-07963

OPTIMAL COST DESIGN OF BRANCHED SEWER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
L. W. Mays, and B. C. Yen.
Water Resources Research, Vol 11, No 1, p 37-47, February 1975. 7 fig, 3 tab, 19 ref. OWRT C-4123(No 9023)(1).

Descriptors: *Sewers, *Cost analysis, *Design, *Pipes, *Dynamic programming, *Methodology, Size, Elevation, Optimization, Storms, Constraints, Hydrology, Hydraulics, Systems analysis, Mathematical models, Equations.
Identifiers: *Branched sewer systems, *Cost minimization, Serial sewer systems, Decomposition technique.

Methodologies for the least cost design of large storm sewer systems are presented. The methods utilize dynamic programming (DP) and discrete differential dynamic programming (DDDP) to achieve optimal cost design of pipe sizes and elevations of branched sewer systems. The basic strategy is to decompose the branched system into equivalent serial subsystems for solutions. For sake of clarity, to demonstrate the optimization techniques, only simple hydraulic model and cost equations are used. The DP approach is discussed first for an easy understanding of the DDP approach, and serial sewer systems are discussed as a prelude to the branched systems. The DDP approach is usually preferred to DP for large systems because of its savings in computer time, although it cannot guarantee global optimization. Major factors affecting the efficiency in using DDP are the location and width of the initial trial trajectory corridor, the number of states (lattice points) used, and the reduction rate of the state increment during iterations. (Bell-Cornell)
W75-07999

UPPER THOMPSON SANITATION DISTRICT, PROJECT NO. C 080322 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-CO-73-1531-F-1, $7.00 in paper copy, $2.25 in microfiche. Volume 1, September 21, 1973. 177 p, 12 tab, 10 map, 3 fig, 1 graph.

Descriptors: *Interceptor sewers, *Sewage, Sewage disposal, Environmental effects, Water

quality, *Colorado, Septic tanks, Sewage effluents, Sewage treatment, Sewerage, Sewers, Recreation, Fishing, Water supply, Wildlife, Aesthetics, Vegetation, Odor, Effluents.
Identifiers: *Environmental impact statements, *Olympus Dam, Colo., *Rocky Mountain National Park(Colo).

The proposed project would construct interceptor sewers in the major subdrainages of the Big Thompson River above Olympus Dam, Colorado. The interceptors would transport sewage from residences presently using septic tanks, from several small package sewage treatment plants, and from some present facilities in Rocky Mountain National Park. The interceptors would transport the sewage to a proposed new tertiary sewage treatment plant to be located on publicly-owned land administered by the U.S. Bureau of Reclamation below Olympus Dam. Favorable environmental impacts included protection of the surface and ground water quality of the Big Thompson River Drainage from inadequately treated sewage effluent from septic tanks and small sewage treatment plants; protection of the waters for recreation, fishing and water supply; and assurance of flexible and reliable sewage treatment service. Adverse environmental effects will entail short-term construction impacts on water quality, vegetation, wildlife, aesthetics, and solitude. Additionally, the sewage treatment plant's operation could result in occastional odors in the immediate vicinity of the plant. Other potential problems are possible plant breakdown, with accompanying raw sewage discharge into the river and slight degradation of water quality due to the nutrient release. The following alternatives are considered: design sizing of the systems; timing of interceptor construction; interceptor location; treatment plant location; effluent disposal; and basin-wide wastewater treatment systems. (Gagliardi-Florida)
W75-08016

SOUTH DADE COUNTY FLORIDA, C120377 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-FL-73-1490-F, $6.25 in paper copy, $2.25 in microfiche. September 11, 1973. 326 p, 15 tab, 8 map, 1 graph, 1 photo.

Descriptors: *Waste water disposal, *Waste water treatment, *Sewage treatment, Sewage effluents, Effluents, Canals, Septic tanks, Waste water(Pollution), Waste treatment, Wastes, *Florida, Sewage disposal, Sewers, Sewage, Sewerage, Deep wells, Environmental effects, Construction, Outfall sewers, Sludge, Sludge disposal.
Identifiers: *Environmental impact statements, *Dade County(Fla).

The project entails construction of major waste water treatment facilities for the South District of Dade County, Florida. Essential features of the overall project are a sewage transmission system intercepting flows from nine sewage systems in the county, a single regional secondary treatment plant which will replace nine smaller plants, and a deep well disposal system for the treated and disinfected effluent. Major beneficial impacts of the proposed action include the elimination of nine waste water treatment plants that are currently discharging inadequately treated effluent into four canals and Biscayne Bay; elimination of septic tanks; diversion of all sewage to a single efficiently-run secondary treatment plant; collection of sewage from areas which are presently unrecovered or undeveloped; and possible recovery and reuse of waste water from the builder zone. Adverse environmental impacts are primarily short-term and associated with the initial construction of the facilities. The following alternative methods of effluent disposal were considered: deep well disposal, disposal through an ocean outfall, alternative methods of sewage treatment, and different plant locations and sludge disposal techniques. (Gagliardi-Florida)
W75-08032

NORTH DADE COUNTY REGIONAL COLLECTION, TREATMENT AND DISPOSAL SYSTEM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-FL-73-1600-F, $4.75 in paper copy, $2.25 in microfiche. October 10, 1973. 460 p, 22 tab, 6 map, 2 fig, 1 graph, 2 photo.

Descriptors: *Treatment facilities, *Waste water disposal, *Water quality, Water quality control, Atlantic Ocean, Environmental effects, Treatment, *Florida, Waste water treatment, Waste water(Pollution), Odor, Septic tanks, Effluents, Marine biology, Beaches, Sludge treatment, Sludge disposal, Sludge.
Identifiers: *Environmental impact statements, North Dade County(Fla).

The proposed project consists of an 80 million gallons per day secondary treatment facility to be constructed at the Interama site east of Biscayne Boulevard in North Dade County, Florida. The method of wastewater disposal will be via a 22,850 foot long, 90-inch diameter ocean outfall, terminating in the Atlantic Ocean. The beneficial environmental effects of the water quality management program include elimination of small wastewater treatment plants; reduction of health hazards; enhancement of water quality; elimination of existing nuisances; and the reduction of individual septic tank systems. Additionally, the discharge of adequately treated effluent into the ocean at the edge of the Florida current, rather than into shallower water closer to shore, will result in improvement of ocean water quality, protection of marine life, enhancement of the beaches, and reduction of health hazards. Adverse impacts which cannot be avoided should the project be implemented include both long and short term deleterious effects on land, water, air and social resources. Several alternatives to the proposed action were considered; different treatment techniques; different treatment sites; different wastewater collection schemes; and several sludge treatment disposal techniques. (Gagliardi-Florida)
W75-08036

CONSTRUCTION OF WASTEWATER FACILITIES, FORT WORTH, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Office of Grants Coordination.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-TX-74-0116-F, $9.25 in paper copy, $2.25 in microfiche. January 16, 1974. 312 p, 15 tab, 5 map, 6 graph.

Descriptors: *Texas, *Waste water treatment, *Sewage effluents, *Sewage treatment, Water quality, Water quality control, Water Quality Act, Environmental effects, Waste treatment, Sewage, Water pollution control, Water pollution treatment, Water law, Water policy.
Identifiers: *Environmental impact statements, *Ft. Worth(Tex).

The project consists of constructing additional wastewater treatment facilities at the Village Creek Wastewater Treatment Facility site. The proposed facilities are expected to reduce health hazards in the area, to enhance water quality in the Trinity River, and to aid in the orderly physical development of local communities. Minor, unavoidable adverse effects include increased noise levels and the possible emanation of odors from the facility, but such drawbacks are to be minimized by modern design techniques and efficient operation. No serious adverse effects are anticipated. Alternatives considered included taking no action; improving the existing 45 MGD Village Creek plant so that it can achieve capability of the required effluent control with odor suppression while upgrading the 30 MGD Riverside plant to achieve the same desired level of effluent control, thus maintaining present capacity but improving the quality of effluent so as to meet current Texas Water Quality Board permit requirements; upgrading the 30 MGD Riverside plant to achieve the required effluent control quality while expanding the Village Creek plant capacity by 20 MGD to a new capacity of 66 MGD (sic), with necessary improvements to achieve required effluent quality, and thus resulting in a total plant capacity of 96 MGD. Under the current, preferred proposal the Riverside plant will be abandoned and the Village Creek plant capacity will be enlarged from 45 MGD to 96 MGD with additions and improvements to meet the effluent quality requirements. (Gerlach-Florida)
W75-08042

UPPER THOMPSON SANITATION DISTRICT, ESTES PARK, COLORADO PROJECT NO. C0803222 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
Availabile from the National Technical Information Service, Springfield, Va. 22161, as EIS-CO-73-1531-F-2, $9.25 in paper copy, $2.25 in microfiche. September 21, 1973. 306 p, 5 tab, 3 map, 1 fig, 6 graph, 1 photo.

Descriptors: *Sanitary engineering, *Discharge measurement, *Nutrient removal, Nitrates, *Colorado, Environmental effects, Phosphorus, Sludge disposal, Interceptor sewers, Disposal, Economics, Engineering, Water quality, Aesthetics, Odor.
Identifiers: *Environmental impact statements, Estes Park(Colo).

This second and final volume of the Upper Thompson Sanitation District, Estes Park, Colorado, environmental impact statement contains an extensive listing and chronology of individual and agency comments and Environmental Protection Agency response raised in public discussion of relevant issues. The statement contains a detailed consideration of the siting for the plant and the location of discharge, the reliability of plant operation, nutrient removal (both phosphates and nitrates), the design and sizing of the system's growth, sludge disposal, and interceptor routings. The following factors were considered in determining the proper plant siting: engineering, economics, water quality, aesthetic values, odor, biotic resources, legal and time delays, cultural and archaeological. (Gagliardi-Florida)
W75-08047

LAKE QUINAULT SEWAGE COLLECTION AND TREATMENT FACILITY, OLYMPIC NATIONAL FOREST, OLYMPIA, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-WA-74-0233-F, $4.75 in paper copy, $2.25 in microfiche. February 11, 1974. 80 p, 3 fig, 2 plate.

Descriptors: *Washington, *Sewage treatment, *Recreation facilities, *Sewage disposal, *Spoil banks, Odor, Pollution abatement, Surface waters, Recreation, Groundwater, Construction, Environmental effects, Environmental sanitation, Drainage area, Sites.
Identifiers: *Environmental impact statements, *Olympia(Wash).

In an effort to abate water pollution emanating from U.S. Forest Service facilities, the Forest Service proposes to construct a sewage collection and treatment facility along the south shore of Lake Quinault on the west side of the Olympic Peninsula in western Washington State. The project will eliminate ground and surface water pollution emanating from the Forest Service facilities, which will assure the continued use of the facilities in the future. Construction of the facility will not generate greater recreational use, but will make the current level of use safer. Only minimal adverse environmental effects associated with the digging of trenches is anticipated. In addition the location of the drainfield and sewage treatment facility will require clearing approximately 5 1/2 acres of land. Among alternatives considered were no action, or relocation of the recreation facilities at a site removed from the lake. (Denvir-Florida)
W75-08054

ENVIRONMENTAL PROTECTION AGENCY'S 1974 NEEDS SURVEY.
Hearing--Subcomm. on Environmental Pollution--Comm. on Public Works, U.S. Senate, 93d Cong, 2d Sess, September 11, 1974. 61 p, 8 tab, 2 append.

Descriptors: *Treatment facilities, *Construction costs, *Federal Water Pollution Control Act, *Sewage treatment, Wastes, Waste treatment, Construction, Treatment, Water pollution control, Water pollution, Water pollution treatment, Sewage, Sewerage, Infiltration, Seepage, Water quality, Water quality control, Water quality standards, Effluents, Environmental effects, Environment.
Identifiers: Administrative regulations, Effluent limitations.

Preliminary state estimates of the cost of construction of publicly-owned treatment works needed to meet the 1983 goals of the Federal Water Pollution Control Act Amendments (FWPCA) of 1972 are presented. The survey asked the states to report their cost estimates in five major categories: costs for facilities which would provide a legally required level of secondary treatment; costs for treatment facilities that must achieve more stringent levels of treatment; costs for correction of sewer system infiltration/inflow problems; costs for construction of collector sewer systems designed to correct violations caused by raw discharge and seepage; and costs to prevent periodic bypassing of untreated wastes. The costs reported in 1974 for the traditional water quality program of treatment plants and interceptors are $17 billion greater than the $36 billion reported in the 1973 survey. Major variations have been identified in the criteria and methodology used by the states in making their estimates. These variances have prompted the EPA to announce that it has reservations about using the preliminary estimates reported in the 1974 survey for future allocation of construction funds among the states. (Gagliardi-Florida)
W75-08065

AREA-WIDE COMPREHENSIVE WATER AND SEWER PLAN: VOLUME I, GENERAL REPORT,
Caldwell (Robert W.) and Associates, Bryan, Tex.
R. W. Caldwell, C. W. Caldwell, G. Barber, and W. Merriman.
Prepared for Panhandle Regional Planning Commission, Amarillo, Texas, Final report No GEN-73-31, April, 1973. 225 p, 28 maps, 49 tab. 50-88-123-124.

Descriptors: *Regional analysis, *Sewerage, *Sewers, *Water supply, Water consumption, Irrigation, Water wells, Septic tanks, Systems analysis, *Texas, Agriculture, Feed lots, Population, Income distribution, *Comprehensive planning.
Identifiers: Gas fields, Oil fields, Amarillo(Tex), *Panhandle Region(Tex), Swisher County(Tex), Wheeler County(Tex), Supply lines, Pipelines, Electric service, Area economic condition.

Topics of general concern based on the Regional Area of 25 counties under the jurisdiction of the Panhandle Regional Planning Commission (PRPC) and a Study Area of 18 counties within the PRPC Region are discussed in Volume I of a 2 part plan. Technical data are presented in Volume II. Population increased significantly in 10 counties between 1940-1970 with greatest increases in Deaf Smith (44%), Hartley (28%, attributable to City of Dalhart growth), Randall (15% due to South Amarillo and Canyon growth), and Sherman (40%). Closing of Amarillo Air Force Base, depleting oil and gas reserves, mechanization of agriculture and diminishing job opportunities contributed to decreases in population. An overall increase in population of 13.5% is projected over the next 20 years (to 1990). Area economic conditions are discussed in terms of the financial conditions of local governments, per capita buying power, income, labor force. Projections to 1990 are made for wages, manufacturing, retail/wholesale trade, and bank deposits. Basic information is given on physical and natural characteristics which influence the ability to provide water and sewer services. Discussions of agriculture, a major topic, include farm characteristics, irrigation, value of agricultural production, and employment. Description of existing public utilities and facilities and a brief discussion of existing methods of obtaining water and disposal of sewage precedes a summary of city and county water and sewer plans. Now 63 water systems exist. Between 1972-1980 eighty-two are proposed for construction, 70 more by 1990. There are now 46 sewer systems. Construction of 61 more before 1980, 49 for the period 1980-1990 are proposed. (See also W75-08182) (Hufschmidt-North Carolina)
W75-08181

AREA-WIDE COMPREHENSIVE WATER AND SEWER PLAN: VOLUME 2, TECHNICAL REPORT,
Caldwell (Robert W.) and Associates, Bryan, Tex.
R. W. Caldwell, C. W. Caldwell, G. Barber, and W. Merriman.
Prepared for Panhandle Regional Planning Commission, Amarillo, Texas, Final report No GEN 73-31, April, 1973. 623 p, 180 maps, 8 tab. 50-88-123-124.

Descriptors: *Water supply, Water pollution, Sewage, *Sewage treatment, *Sewage disposal, Water resources, *Water consumption, Distribution systems, *Capital costs, Rural areas, Water distribution, Water treatment, *Texas.
Identifiers: *Panhandle Region(Tex), Amarillo(Tex), Dalhart(Tex), Canyon(Tex), Perryton(Tex), Capital improvement program.

General discussions of water and sewer planning criteria and technique, and a summary discussion of the Regional Water and Sewer Plan precede a presentation of present status and projections to 1990 of water and sewage flows and needed facilities. Each of 18 counties in the study area is considered separately. Items covered include country aggregates of population projections, water resources, pollution control. With in each county individual communities are discussed in terms of water consumption, water supply, distribution system, sewage system, capital improvement program, with cost estimates usually based on on 1973 prices and very preliminary engineering studies. Rural water systems are proposed where there is or will be enough population to serve economically or where the availability of potable ground water is doubtful. Rural sewerage systems were generally determined as infeasible where population is or will be insufficient to support a central system. Septic tanks are considered the logical alternative. Each individual system is mapped. In addition to the smaller communities (under 5,500 populations) and rural areas, four cities are included: Dumas, Dalhart, Canyon, and Perryton, and also the Amarillo SMSA. The time period for the population and water and sewer system projections is 1972-1990, broken down into two periods 1972-1980 and 1980-1990. Cost estimates are listed in the Capital Improvements Program only for the first period. (See also W75-08181) (Park-North Carolina)
W75-08182

ANALYSIS OF COST-SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
H. E. Marshall, and R. T. Ruegg.
Prepared for Office of Research and Monitoring, US Environmental Protection Agency, Washington, DC Final Report NBSIR 74-479, September, 1974. 137 p, 10 fig, 11 tab, 34 ref.

Descriptors: *Cost sharing, Cost-benefit analysis, *Water utilization, *Pollution abatement, *Water Quality Act, *Water pollution control, *Project planning, *Cost analysis, Economic efficiency, Sewage treatment, *Waste water treatment, Treatment facilities.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, EPA, Plant treatment, Nonplant treatment.

An evaluation of existing and alternative cost-sharing programs for water pollution abatement deals primarily with their national efficiency and equity effects. The existing cost-sharing program described in the Federal Water Pollution Control Act Amendments of 1972 and implemented by EPA regulations is discussed. The analysis identifies theoretical relationships between cost sharing and its incentive effect on community decisions regarding size of abatement projects and techniques used therein. Two types of efficiency issues, the least-cost techniques and the efficient scale, are examined. Case examples illustrate the biasing effects of current rules that apply different cost-sharing percentages to different techniques and cost categories. To eliminate the bias, the study identifies action to increase local share of abatement costs, reduce cost-sharing bias toward capital-intensive, land-intensive projects, reduce the cost-sharing bias for plant over non-plant techniques, increase the degree of abatement per national dollar spent and, in general, result in more efficient and equitable projects. By changing the effective-cost shares, user fees influence community government's choice of abatement programs. Also, to include an interest charge in user fees collected from industry would help assure that industry paid its full share of costs. (Salzman-North Carolina)
W75-08186

WATER QUALITY MANAGEMENT PLAN--SUMMARY REPORT,
Department of Metropolitan Development, Indianapolis, Ind. Div of Planning and Zoning.
610: Water Quality Control Program, 1970-76, for the Indianapolis-Marion County Metropolitan Area, May, 1973. 168 p, 32 fig, 35 tab.

Descriptors: Water quality, *Water quality control, Water pollution control, Water allocation(Policy), *Planning, Economic efficiency, *Water management(Applied), *Alternate planning, *Comprehensive planning, *Sewage systems, Cost analysis, Multiple purpose projects, Abatement, Pollution control, *Indiana, Treatment facilities.
Identifiers: Non-point source treatment, Multiple management.

To improve and maintain water quality in the 8-county Indianapolis SMSA, a cost-effective and environmentally sound program of water quality management has been developed. After examining demographic, economic and land use factors for the area, the study developed immediate and long term structural and nonstructural measures for abating pollution from point and nonpoint sources. A collection system conveying the flow from com-

bined sewer overflows singularly, or in combination with storm sewer discharges, to a single treatment location provides the most cost-effective solution to urban runoff pollution. Rural runoff pollution may be abated through implementation of good conservation practices. The plan identifies the present water quality situation, existing and anticipated pollution sources and the necessary actions to provide and maintain adequate water quality. A range of management structures and possible financial programs are outlined. Environmental assessment of the plan considers the impact of new treatment facilities on the water quality, land uses and the total region. Final recommendations suggest that (1) a comprehensive regional water quality sampling and monitoring network be established, (2) a regional system as the most cost-effective and environmentally sound approach be established, (3) treatment facilities be upgraded with proper state and federal regulatory agencies, and (4) a multiple management structure for program implementation be developed. (See also W75-08188) (Salzman-North Carolina)
W75-08187

WATER QUALITY MANAGEMENT PLAN (APPENDIX E - VOLUME 3), WASTEWATER COLLECTION AND TREATMENT RECOMMENDATIONS FOR BOONE AND HAMILTON COUNTIES,
Department of Metropolitan Development, Indianapolis, Ind. Div. of Planning and Zoning.
610: Water Quality Control Program of the Unifed Planning Program, 1970-76, for the Indianapolis-Marion County Metropolitan Area, May, 1973. 90 p, 2 fig.

Descriptors: Cost-benefit analysis, *Economic efficiency, *Project planning, *Water utilization, *Sewage treatment, *Sewage districts, Sewage disposal, Pollution abatement, *Indiana, Treatment facilities, *Cost analysis.
Identifiers: Boone County(Ind), Hamilton County(Ind), Indianapolis-Marion County Metropolitan Area(Ind).

One of six volumes, this study defines the general sewage collection system and sewage treatment plant improvements required for each community in Boone and Hamilton Counties. Facility requirements are delineated on an individual community basis and in combination with other population centers. Feasibility of the community combining with another entity to achieve savings in wastewater handling is evaluated and the combination which would provide the most economical regional collection and treatment system is defined. Combining sewerage facilities through regionalization indicates cost savings in many areas. Cost allocations to the entities involved in regionalization plans are calculated as proportions of peak hour flows for sewage collection systems and average day flows for sewage treatment facilities. Values are only illustrative of one allocation approach. Equitable cost allocations must be negotiated between the parties in each regionalization system. Specific recommendations are given for each community for the sewage collection system and for sewage treatment facility after alternatives have been set forth. (See also W75-08187) (Salzman-North Carolina)
W75-08188

THE RECLAMATION OF SULFURIC ACID FROM WASTE STREAMS,
New Jersey Zinc Company, Palmerton, Pennsylvania. Research Department.
H. C. Peterson, and P. L. Kern.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 791, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Cincinnati, Ohio. Report EPA-670/2-75-016, April 1975. 44 p, 12 fig, 12 tab, 8 ref. 1BB036; ROAP 21AZQ; Task 07/08. S-801349.

Descriptors: *Sulfuric acid, Reclamation, *Waste treatment, Operating costs, *Evaporation, Titanium, Byproducts, *Industrial wastes, Recycling, *Pennsylvania.
Identifiers: *Sulfuric acid reclamation, *Titanium dioxide manufacture, Titanium dioxide byproducts, Acid recovery.

The New Jersey Zinc Company process for acid recovery employs spray evaporation to separate sulfuric acid from metallic sulfates. The salts are removed as dry, free-flowing solids and the acid-laden off-gas is directly cooled to partially condense product acid having a concentration in excess of 85% H2SO4. The process was piloted at Palmerton, Pennsylvania, at a rate of two tons per day of sulfuric acid (100% basis) using as feed the waste stream of a titanium dioxide pigment plant. On the basis of the pilot work, a commercial plant was designed to process 345,000 metric tons annually of 19.5% H2SO4 waste end liquor from a 38,100-metric-ton-per-year pigment plant. The estimated investment (as of January 1, 1975) is $7,800,000. Operating costs (including depreciation at 10%) would be approximately $77 per metric ton of 100% H2SO4 recovered. This cost includes neutralization of the dried solids and disposal in a landfill site. (EPA)
W75-08228

COPPER RECOVERY FROM BRASS MILL DISCHARGE BY CEMENTATION WITH SCRAP IRON,
Anaconda American Brass Co., Waterbury, Conn.
O. P. Case.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 822, $3.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-75-029, April 1975. 50 p, 7 fig, 8 tab, 6 ref. 1BB036; ROAP 21AZO; Task 23. S-803226-01-0.

Descriptors: Water pollution, Industrial wastes, *Waste water treatment, Pollution abatement, Waste treatment, Recycling, Iron, Copper.
Identifiers: *Copper recovery, *Hexavalent chromium reduction, Metal finishing wastes, *Metals recovery, Cementation, Iron reductant.

Results are presented of studies of copper recovery (and incidental reduction of hexavalent chromium) in brass mill discharge by passage of the discharge over scrap iron in a rotating drum. The drum feed consisted of normal production discharge of combined pickle rinse water and spent sulfuric acid and sulfuric acid - bichromate pickle. About half of the total mill waste discharge over a period of 16 weeks was processed. Four modes of drum operation were studied: (1) continuous rotation, (2) no rotation, (3) intermittent rotation (1 hr off - 5 min on), and (4) intermittent rotation (2-1/2 hr off - 10 min on). Each mode was studied at two flow levels and two scrap iron surface area levels. Data were evaluated in terms of percent cementation of available copper, excess iron consumption over theoretical, and completeness of chromium reduction. Results indicate that the over-riding factor in the efficiency of copper cementation is the level of copper in the feed solution. Hexavalent chromium is effectively reduced providing the pH is below 2.5. (EPA)
W75-08229

LIME STABILIZED SLUDGE: ITS STABILITY AND EFFECT ON AGRICULTURAL LAND,
Battelle Pacific Northwest Lab., Richland, Wash.
C. A. Counts, and A. J. Shuckrow.
Available from the National Technical Information Service, Springfield, Va. 22161 as PB-241 809, $4.75 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-75-012, April 1975. 87 p, 33 fig, 30 tab, 16 ref. 1BB043;ROAP-21ASD;Task-16. EPA Contract 68-03-0203.

Descriptors: Calcium hydroxide, Lime, Sludge disposal, Disinfection, Odors, *Sludge treatment, Sewage sludge, Crop response, *Waste water treatment.
Identifiers: *Sludge stabilization, *Lime treatment, Liquid phase lime demands, Solid phase lime demands, Agricultural land, *Odor control.

An optimum system for the lime stabilization of municipal sewage sludge was developed and evaluated. The primary objectives were: (1) to determine the degree of stability induced in a sludge by lime addition and (2) to determine the effects of spreading lime-stabilized sludge on agricultural land. Lime doses and contact times required to eliminate the pathogenic bacteria and odors from a raw sludge were determined by laboratory studies, and the information obtained was translated into design and operational parameters for a pilot scale, continuous flow process. Physical, chemical, and biological characteristics of both the raw and stabilized sludges were measured. Soil and crop studies, both in a greenhouse and on controlled outdoor plots, were performed to determine the effects of spreading lime-stabilized sludge. Effective lime stabilization of sludge was accomplished by elevating the pH to 12.0 with lime addition and maintaining this pH level for at least 30 minutes. From 102 to 208 g of Ca(OH)2 was needed to stabilize 1.0 kg of sludge solids. The average amount required was 150 g. Total operation and maintenance costs for lime stabilization were estimated to be $10 per metric ton. (EPA)
W75-08232

CHLOR-ALKALI PRODUCERS SHIFT TO DIAPHRAGM CELLS,
For primary bibliographic entry see Field 3E.
W75-08235

EPIDEMIOLOGICAL CONSEQUENCES OF VIRUS CONTAMINATION OF WATERS, (IN FRENCH),
Hopital Milerie, Poitiers (France). Laboratoire C. Nicolle.
For primary bibliographic entry see Field 5C.
W75-08243

PERFORMANCE OF REGIONALLY RELATED WASTEWATER TREATMENT PLANTS,
McGill Univ., Montreal (Quebec). Dept. of Civil Engineering and Applied Mechanics.
B. J. Adams, and R. S. Gemmell.
J Water Pollut Control Fed, Vol 45, No 10, p 2088-2103, 2237, 1973, Illus.

Descriptors: *Treatment facilities, *Waste water treatment, Regional analysis, *Performance, Effluents.
Identifiers: Decentralization.

Statistical analyses of the performances of regionally related wastewater treatment plants indicated that little linear trend could be discerned in individual plant results. In analysis for cyclical variation, only the 1st harmonic appeared influential for influent and effluent parameters, and the 1st and 4th for discharge. Non-random forces had some significance in long-term records, whereas sequences of monthly means were random. Among plants, only a weak correlation among influent and effluent quality variables was noted, but discharge correlation was much stronger. Decentralized treatment systems can lessen high peaks in waste load variability; many relatively independently performing plants will tend to result in combined performance with less variance than wili a single plant.--Copyright 1974, Biological Abstracts, Inc.
W75-08315

SUGAR MILL EFFLUENT TREATMENT WITH NUTRIENT ADDITION,
National Inst. for Water Research, Congella (South Africa). Regional Lab.

D. E. Simpson, and J. Hemens.
J Water Pollut Control Fed, Vol 45, No 10, p 2194-2243, 1973, Illus.

Descriptors: *Waste water treatment, *Activated sludge, *Industrial wastes, Oxygen demand, Dewatering.
Identifiers: Sugar mill wastes.

Laboratory studies showed that efficient activated sludge treatment of sugar mill effluent is possible if supplementary N and P are provided. Nutrient addition can approximately double the rate of chemical oxygen demand (COD) removal and is essential for proper sludge settlement and low effluent/turbidity. Minimum satisfactory supplementary COD : N : P in input was 100 : 2 : 0.4, and optimum load factor was 0.6 g COD/-day/g mixed liquor suspended solids with average sludge volume index of 53. Average effluent COD and biochemical oxygen demand were 97 and 13 mg/l, respectively. Dewatering of excess sludge can be achieved on a conventional drying bed with pretreatment.--Copyright 1974, Biological Abstracts, Inc.
W75-08348

5E. Ultimate Disposal Of Wastes

NORTH DADE COUNTY REGIONAL COLLECTION, TREATMENT AND DISPOSAL SYSTEM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W75-08036

LIME STABILIZED SLUDGE: ITS STABILITY AND EFFECT ON AGRICULTURAL LAND,
Battelle Pacific Northwest Lab., Richland, Wash.
For primary bibliographic entry see Field 5D.
W75-08232

5F. Water Treatment and Quality Alteration

COMPARISON OF GELATINE AND KIEBO PLATES FOR DETERMINING THE COLONY COUNT IN DRINKING WATER: I, (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Institut fuer Wasser-, Boden-, und Lufthygiene.
For primary bibliographic entry see Field 5A.
W75-07933

STATUS OF ADVANCED WASTE TREATMENT,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
For primary bibliographic entry see Field 5D.
W75-07956

DESALTING TECHNIQUES FOR WATER QUALITY IMPROVEMENT.
American Water Works Association Research Foundation, Denver, Colo.
For primary bibliographic entry see Field 3A.
W75-07998

EPIDEMIOLOGICAL CONSEQUENCES OF VIRUS CONTAMINATION OF WATERS, (IN FRENCH),
Hopital Miletrie, Poitiers (France). Laboratoire C. Nicolle.
For primary bibliographic entry see Field 5C.
W75-08243

5G. Water Quality Control

REMOTE SENSING TECHNIQUES FOR EVALUATION OF URBAN EROSION AND SEDIMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4C.
W75-07880

WATER FACTS AND FIGURES FOR PLANNERS AND MANAGERS,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 6B.
W75-07889

WATER AND SALT TRANSFERS IN SUTTER BASIN, CALIFORNIA,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.
W75-07925

DETERMINING AMBIENT WATER TEMPERATURES,
Stone and Webster Engineering Corp., Boston, Mass. Environmental Engineering Div.
For primary bibliographic entry see Field 5B.
W75-07929

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY4, Proceedings Paper 11256, p 329-340, April 1975. 1 tab, 7 ref, 1 append.

Descriptors: *Soil erosion, *Accelerated erosion, *Sediment yield, *Cities, Construction, Education, Erosion, Land use, Legislation, Sediments, Sedimentation rates, Sediment control, Research and development, Streams, Urbanization, Urban runoff, Urban drainage, Environmental control, Urban hydrology, Storms, Erosion control, Costs.
Identifiers: *Environmental protection, Soil loss, Urban impacts.

The present system of coping with accelerated erosion and sediment movement in areas of urban development tends towards application of a large array of control techniques, mostly borrowed from rural settings. But too little is known of their control effectiveness, or whether they represent the optimum treatment, or whether they are needed in the first place. A systematic method is needed for estimating sediment movement that can be coupled with a specifically designed set of controls to minimize the adverse effects of sediment movement. This should be done in a manner that would insure that the probable reduction in damages would exceed the cost of application of such control. The need for legislative, educational, and research activities to stimulate progress in solving the many different kinds of urban sediment problems was examined. (Lee-ISWS)
W75-07931

WASTEWATER USE AND GROUNDWATER RECHARGE IN LOS ANGELES COUNTY,
Los Angeles County Flood Control District, Calif.
For primary bibliographic entry see Field 5D.
W75-07958

WASTEWATER MANAGEMENT ACTIVITIES AT THE BROOKHAVEN NATIONAL LABORATORY,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5D.
W75-07961

USE OF MICROORGANISMS TO DISPERSE AND DEGRADE OIL SPILLS,
Exxon Research and Engineering Co., Linden, N.J. (assignee)
R. R. Mohan, G. H. Byrd, Jr., J. Nixon, and E. R. Bucker.
U. S. Patent No 3,871,957, 14 p, 28 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 932, No 3, p 1065, March 18, 1975.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution control, Shore protection, *Microorganisms, Biological treatment, *Pollution abatement, Beaches, Coasts, Bacteria.
Identifiers: Arthobacter, Micrococcus, Achromobacter.

A new method is described for the preparation and application of specified microoganisms for the rapid dispersal of oil spills found in open seas, along beaches, in coastal areas and along the shore lines and also for protecting beaches and solid surfaces against oil contamination. The process of preparing freeze-dried cultures of selected bacterial species of hydrocarbon consuming microorganisms involves growing the mixed population in a suitable aqueous medium containing high inorganic phosphate concentration and a suitable easily assimiable inorganic nitrogen source, trace metals and a hydrocarbon containing C8 to C18 carbons as the only carbon source. The preparation is generally reconstituted in suitable aqueous medium such as water or sea water and applied onto the oil or hydrocarbon surfaces or sprayed on the solid surfaces such as beaches, rocks, shore lines, to prevent oil contaminating the solid surfaces. (Sinha-OEIS)
W75-07964

MODAL CITIES,
Dartmouth Coll., Hanover, N.H. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W75-07967

LAND USE FORMS AND THE ENVIRONMENT - AN EXECUTIVE SUMMARY,
Chicago Univ., Ill. Dept. of Geography; and Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 6G.
W75-07971

GROUND-WATER QUALITY RELATED TO IRRIGATION WITH IMPORTED SURFACE OR LOCAL GROUND WATER,
Agricultural Research Service, Fresno, Calif.
For primary bibliographic entry see Field 5B.
W75-07978

WINTER-REGIME SURFACE HEAT LOSS FROM HEATED STREAMS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 5B.
W75-07990

ECONOMIC AND INSTITUTIONAL ANALYSIS OF COLORADO WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. A. Young, G. Radiosevich, S. L. Gray, and K. L. Leathers.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 946, $5.25 in paper copy, $2.25 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report Series No 61, March 1975. 105 p, 6 fig, 22 tab, 28 ref. OWRT B-042-COLO(3).

Descriptors: *Colorado, *Water quality, *Management, *Water pollution control,

*Economic impacts, *Institutions, Evaluation, Legal aspects, *Waste dilution, *Return flow, Irrigation water, Salinity, Water pollution sources, Legislation, Administration, Forecasting, Regional analysis.
Identifiers: *Grand Valley(Colo).

Waste products of production and consumption activities are often discharged into the nation's watercourses. The objective of this study was to develop information on economic and institutional aspects of water quality management in Colorado. An economic conceptualization of the water quality management problem is presented. The legal and institutional settings within which the present water pollution control program operates is reviewed and described. Two economic case studies are presented. One provides estimates of the economic value of water for waste dilution and the other examines economic impacts of programs for control of saline irrigation return flows in western Colorado.
W75-07992

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: WATER QUALITY MODELING,
Washington State Univ., Pullman. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W75-07995

THE IMPACT OF HIGH INTEREST RATES ON OPTIMUM MULTIPLE OBJECTIVE DESIGN OF SURFACE RUNOFF URBAN DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
W. L. Miller, and S. P. Erickson.
Water Resources Bulletin, Vol 11, No 1, p 49-59, February 1975. 2 fig, 4 tab, 18 ref. OWRT C-3277(No 3713)(6), 14-31-0001-3713.

Descriptors: *Economic impact, *Interest rates, *Design, *Urban drainage, *Surface runoff, *Water quality, Methodology, Linear programming, Assessment, Economic efficiency, Water pollution control, *Indiana, Optimization, Costs, Rainfall, Mathematical models, Systems analysis.
Identifiers: *Multiple objectives, Cost minimization, Integer programming, Cost effective, Discount, Treatment plants, Environmental quality Equilibrium analysis, Sensitivity.

Studied is the impact of high interest rates on the least cost system design of urban drainage systems when water quality is a critical parameter. Twelve alternative system designs in a case study watershed in Indiana are examined. Objectives considered are economic efficiency and environmental quality. Linear integer programming is used to determine the cost of the alternative system designs and the sensitivity of the optimal solution to varying levels of interest rates and water pollution. Results indicate that the least cost study design is highly sensitive to the rate of interest but not sensitive to the water quality parameters. When the high rates of interest currently prevalent are introduced into the model, those systems containing open channel collection components are selected as the minimum cost system. At low rates of interest, pipeline collection components are selected as the least cost system. Holding pond components of the system design are cost effective at several levels of water quality. They are neutral to the rate of interest so they are incorporated in least cost systems at all levels of interest rates. Results show that at the current high rates of interest, open channel collection systems and holding ponds are cost effective system components to achieve selected levels of water quality in urban drainage system design. (Bell-Cornell)
W75-08001

DEVELOPING BIOLOGICAL INFORMATION SYSTEMS FOR WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., G. R. Lanza, R. E. Sparks, and W. T. Waller.
Water Resources Bulletin, Vol 9, No 1, p 81-99, February 1973. 10 fig, 6 tab, 10 ref. OWRT A-039-VA(3).

Descriptors: *Water pollution control, *Industrial wastes, *Management, Aquatic environment, *Monitoring, *Quality control, Streams, Fish, Diatoms, Bioindicators, Rivers, Measurement, Efficiency, Toxicity, Time lag, Simulation analysis.
Identifiers: *Biological monitoring, Aquatic ecosystems, Industrial plants, Laser holography, Information feedback, Waste discharge.

Management of aquatic ecosystems requires a clear understanding of the goals to be achieved, appropriate information and the means to achieve the goals. Control measures applied to aquatic ecosystems, in the absence of information on the condition of the system, are apt to be in appropriate and thus may overprotect the receiving system at times and underprotect it at other times since the ability of ecosystems to receive wastes is not constant. A major determinant of the effectiveness and efficiency of ecological quality control is the lag time in the feedback of information. If the lag is too great, the control measures may repeatedly overshoot or undershoot the desired goal. Present techniques for measuring the responses of aquatic organisms and communities require days or weeks, whereas information for ecosystem quality control and prevention of ecological crises should be generated in minutes or hours. Two biological monitoring systems developed to generate information rapidly are presented. One system measures changes in the movement and breathing of fish in order to provide an early warning of developing toxicity in the wastes of an industrial plant. The other system measures changes in the diversity of algal communities in streams by means of laser holography. The incorporation and use of these systems in industrial plants is discussed. (Bell-Cornell)
W75-08002

WATER QUALITY CONTROL BY ARTIFICIAL AERATION OF STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
S. H. Lin, L. T. Fan, and C. L. Hwang.
Water Resources Bulletin, Vol 9, No 5, p 874-883, October 1973. 6 fig, 1 tab, 17 ref. OWRT-B-030-KAN(3).

Descriptors: *Water quality control, Streams, *Thermal pollution, *Organic wastes, *Dissolved oxygen, *Simulation analysis, Velocity, Biochemical oxygen demand, Aquatic life, Upstream, Systems analysis, Mathematical models.
Identifiers: *Artificial aeration, *Diffusor aerators, *Streeter-Phelps equation, Waste discharges.

The installation of artificial aerators for water quality control of a stream which receives thermal and organic waste discharges is investigated. Considered are diffusor aerators, which use compressed air as a means of maintaining stream DO content. The modified Streeter-Phelps model including an energy balance equation is used to determine the location and number of diffusor aerators to be installed along the stream so as to maintain the stream DO concentration above a minimum requirement (4 mg/1 or 5 mg/1) for normal aquatic life. Effects of stream velocity, upstream BOD concentration, amount of thermal discharge, and rates of thermal and organic waste discharges to the stream are examined. Results indicate that the waste discharge as well as thermal discharge are important factors in designing a water quality control system based on artificial aeration. In general, the number of aerators required to maintain the minimum water quality increases with increasing waste and thermal discharges. Increasing stream velocity results in a need for additional aeration. The systematic approach presented provides a convenient method for determining the location and number of aerators which need to be installed to control water quality. (Bell-Cornell)
W75-08005

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
W. D. Haseman, A. Z. Lieberman, and A. B. Whinston.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings paper No 11185, p 477-493, March 1975. 9 fig, 7 ref. OWRT A-024-IND(9).

Descriptors: *Computers, *Information retrieval, *Management, *Water quality, *Water pollution, Rivers, Water treatment, *Planning, Model studies, Simulation analysis, Costs, Pollution, Decision making, Optimization, Data collections, Systems analysis.
Identifiers: Information systems, Management systems, Information flow model, Cost minimization.

Problems and approaches in developing an information system that will most effectively aid planners are presented. An information flow model is applied to the waste load allocation problem. Considered are the models needed to generate the appropriate information for designing a cost effective system guaranteed to maintain the minimum water quality standards. The analysis of information needs centers around the concept of a system's complexity. A simpler information system has only the function of retrieving data from a data base. An example of this is STORET, the information system currently being used by the states' stream pollution control boards. GPLAN is a much more complex system; it has the capability of interfacing application programs with the data base. River models and simulators are controlled by GPLAN to take its output from a data base and store its output in this same data base for latter reference. GPLAN offers an information retrieval language approaching a natural-language syntax and allows the user to command execution of the application programs via the query language. (Bell-Cornell)
W75-08007

ORD PUBLICATIONS SUMMARY.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
Available from the National Technical Information Service, Springfield, Va, 22161 as PB-241 782, $5.25 in paper copy, $2.25 in microfiche. Report EPA-600/9-75-001a, March 1975, 122 p.

Descriptors: *Bibliographies, *Abstracts, *Publications, *Environment, *Documentation, Water quality, Water pollution, *Indexing, *Projects, Programs.

This is the first issue of the EPA's Office of Research and Development's (ORD's) quarterly ORD Publications Summary. This Summary is intended to provide a current listing (since July 1973) of ORD's final reports on in-house, grant, contract, and interagency projects. A New Report Abstracts Section is included in the Summary to provide brief abstracts of recently printed reports, as well as indices by Title, Program Area (subject), Performing Organization, Personal Author, Report Number, and Grant, Contract, or Interagency Agreement Number to aid the reader in identifying reports of interest. Instructions on how to order copies of reports are included. (EPA)

W75-08014

MAINTENANCE OF BUTTERMILK CHANNEL, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 8A.
W75-08017

PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE, OFFSHORE MISSISSIPPI, ALABAMA AND FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-MS-73-1651-F-1, $9.50 in paper copy, $2.25 in microfiche. Volume 1, Description of the Proposal, etc., October 17, 1973. 327 p, 40 tab, 45 map, 23 fig, 7 graph.

Descriptors: *Gasoline, *Oil, *Oil pollution, *Oil spills, *Gulf of Mexico, Continental shelf, Wastes, Mississippi, Alabama, Florida, Oil industry, Environmental effects, Shoreline cover, Shore protection, Shores.
Identifiers: *Environmental impact statements, Energy crisis, Oil Pollution Act.

The project involves a proposed oil and gas lease sale on the outer continental shelf of the Gulf of Mexico. One hundred and forty-seven tracts (817,338 acres) of outer continental shelflands are to be included in the leasing action. The tracts are located offshore Mississippi, Alabama, and Florida. All tracts offered pose some degree of pollution risk to the environment and adjacent shoreline. The risk potential is related to adverse effects on the environment and other resource uses which may result from accidental or chronic oil spillage. Each tract offered is subjected to a matrix analytical technique in order to evaluate significant environmental impacts should leasing and subsequent oil and gas exploration and production ensue. The following alternatives to the proposed action were considered: hold the sale in modified form; withdraw the sale; or delay the sale. (Gagliardi-Florida)
W75-08018

BLUE MARSH LAKE PROJECT, TULPEHOCKEN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 8D.
W75-08019

SOUTH DADE COUNTY FLORIDA, C120377 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W75-08032

MAINTENANCE DREDGING, BRONX RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, New York.
For primary bibliographic entry see Field 8A.
W75-08037

DIKED DISPOSAL AREA, HURON HARBOR, ERIE COUNTY, HURON, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, NY.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-OH-73-1857-F, $4.75 in paper copy, $2.25 in microfiche. November 28, 1973. 88 p, 6 fig, 7 tab, 2 append.

Descriptors: *Sediment control, *Lake Erie, *Dredging, *Sedimentary structures, Sediments, Sedimentation, Pollution abatement, Pollutants, Aesthetics, Water quality, Water pollution control, Recreation facilities, Recreation, Turbidity, Sites, *Ohio.
Identifiers: *Environmental impact statements, Huron(Ohio).

The project is designed to remove polluted harbor sediment from Lake Erie which has resulted from annual dredging operations. An offshore contained spoil disposal structure to receive the sediment will be constructed which will abate pollution from the dredging for a period of ten years, at which time it is expected that the pollutants reaching the Lake and Harbor will be controlled at their sources. Construction and operation of the spoil area will cause some local convenience and unsightly conditions but water quality enhancement, long term recreational benefits associated with fishing and waterfront opportunities are expected to improve. Some turbidity will result during construction, and thereafter annually during dredging operations. Continued open lake dumping, discontinuance of maintenance dredging, disposal at alternate sites, and treatment of polluted dredge spoil were considered, but rejected. (Denvir-Florida)
W75-08048

RICHMOND INNER HARBOR, MAINTENANCE DREDGING, CONTRA COSTA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-CA-73-1830-F, $4.25 in paper copy, $2.25 in microfiche. 26 November 1973. 61 p, 8 tab, 4 map.

Descriptors: *Dredging, *Channel improvement, Shoals, Channels, Harbors, Disposal, Channeling, *California, Benthic fauna, Maintenance, Turbidity, Benthic flora, Silts, Environmental effects, Sessile algae, Oxygen, Oxygen sag.
Identifiers: *Environmental impact statements, Contra Costa County(Calif), *Alcatraz Island(Calif).

The proposed action involves the maintenance dredging of shoal areas in the port of Richmond and the maintenance of other channels and disposition of dredged materials at Alcatraz, California. These maintenance operations are deemed necessary to provide for the continued vessel use of the harbor. There will be an increase in turbidity during dredging and disposal and the accompanying displacement of benthic organisms. The resuspension of silt will possibly adversely affect fishlife and plankton by increasing turbidities. Other adverse environmental effects are the removal of sessile benthic organisms in areas to be dredged, a temporary oxygen sag in the area, a temporary disruption of benthic fauna in areas adjacent to the dredge site and in the disposal area, and a temporary reduction in mean population numbers. The alternatives available for consideration were ocean disposal, land disposal, or no action. (Gagliardi-Florida)
W75-08049

LAKE QUINAULT SEWAGE COLLECTION AND TREATMENT FACILITY, OLYMPIC NATIONAL FOREST, OLYMPIA, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 5D.
W75-08054

COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES V. BOROUGH OF CARLISLE (APPEAL FROM ORDER PROHIBITING DISCHARGES INTO SANITARY SEWER SYSTEM WITHOUT DER APPROVAL).
330 A.2d 293-300 (Pa. Cmwlth. 1974).

Descriptors: *Environmental control, *Sewage treatment, *Permits, Streams, Water quality control, *Pennsylvania, Environmental effects, Environment, Resources, Discharge(Water), Pollution abatement, Pollutants, Sewers, Sewerage, Sewage, Sewage disposal, Water quality, Water, Water quality standards, Water pollution, Water pollution control.
Identifiers: Administrative regulations, Hazardous substances(Pollution).

The Pennsylvania Department of Environmental Resources (DER) issued an order prohibiting additional discharges without DER approval into a sanitary sewer system tributary to a borough sewer system. Both the borough and the borough sewer authority appealed. The Environmental Hearing Board (EHB) then amended the order to allow the issuance of four new permits per month, prompting all parties to appeal. The Commonwealth Court held that the EHB afforded a proper statutory hearing even though the DER had not provided a hearing prior to the issuance of its order and that the evidence sustained its finding that the sewer authority's plant was polluting the river into which it discharged. However, the court found that in view of the fact that a new plant would be built within three years and that even a non-polluting plant at the current site could not restore the stream to an unpolluted state within three years, the decision of the EHB to amend the order should be sustained. (Gagliardi-Florida)
W75-08069

SHELL OIL CO. V. POLLUTION CONTROL BOARD (PETITION BY OIL CO. TO REVIEW DENIAL OF VARIANCE FOR DISCHARGE OF WASTE WATER CONTAINING CYANIDE).
321 N.E.2d 170-174 (App. Ct. Ill. 1974).

Descriptors: *Oil pollution, *Pollution abatement, *Pollutants, *Illinois, Discharge measurement, Oil industry, Oil, Oil wastes, Water, Wastes, Waste water(Pollution), Waste water treatment, Waste treatment, Waste identification.
Identifiers: Administrative regulations, Evidence.

Plaintiff oil refinery petitioned for review of an order of the Illinois Pollution Board denying the refinery's motion for reconsideration of an order denying a petition for variance from the Board rule governing the discharge of waste water containing cyanide. The Illinois Appellate Court, Fifth District, held that denial of the petition for variance was not against the manifest weight of evidence that the oil refinery refused to comply with the Board's request for a showing of firm assurance of compliance or attempted compliance with the rule. The court refused to consider evidence presented by affidavit in support of the motion for reconsideration since it was untimely and improper under Board rules. Additionally, the court held that the oil refinery was not denied equal protection because other oil refineries which had instituted good-faith programs to correct excessive cyanide discharges were granted variances. (Gagliardi-Florida)
W75-08070

VILLAGE OF GLENCOE V. METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO (ACTION TO REVIEW DISTRICT'S WASTE CONTROL ORDINANCE WHICH PROHIBITED ANY DISCHARGE OF SEWAGE, INDUSTRIAL OR OTHER WASTE INTO LAKE MICHIGAN).
For primary bibliographic entry see Field 6E.
W75-08071

THE ENVIRONMENTAL PROTECTION AGENCY AND COASTAL ZONE MANAGEMENT: STRIKING A FEDERAL-STATE BALANCE OF POWER IN LAND USE MANAGEMENT,
H. A. Cassidy, and S. Kladis.
Houston Law Review, Vol 11, p 1152-1193 (1974). 52 p, 408 ref.

Descriptors: *Environmental control, *Protection, *Land use, *Texas, *Federal government, Coasts, Planning, Legislation, Constitutional law, Land development, Land management, Land resources, Conservation, Administrative agencies, Pollution abatement, Water pollution control, Clean Air Act.
Identifiers: *Coastal zone management, *National Environmental Policy Act, *Environmental Protection Agency, Coastal Zone Management Act, Environmental policy.

Traditionally, a balance has existed between landowners' rights and public controls, but today a quiet revolution in land use laws is effecting radical changes. Numerous federal regulations are discussed, with particular emphasis on coastal zone management. Today, there are two major sources of activity in land use controls: the National Environmental Policy Act as enforced by the Environmental Protection Agency (EPA) and the recently enacted Coastal Zone Management Act. The accretion of power in the EPA through congressional enactments and executive directives and the potential for the exertion of the EPA's power in land use management are discussed. Federal and state interactions in environmental control are examined in light of the experience in Texas with the EPA under the provisions of the Clean Air Amendments of 1970. Also discussed are the Coastal Zone Management Act, its legislative history, accompanying guidelines, grant qualifications, and the required interagency coordination at the federal, state, and local levels. Special emphasis is placed on Texas and its current effort to qualify for Coastal Zone Management Act funding. States must plan and control land uses according to federal guidelines or forfeit their local options to federal decision making. (Fernandez-Florida)
W75-08073

MEDICAL ASPECTS OF CHILDHOOD LEAD POISONING.
U.S. Health Service and Mental Health Administration Health Reports, Vol 86, No 2, p 140-143, February 1971. 16 ref.

Descriptors: *Lead, *Toxicity, *Public health, *Testing procedures, Human pathology, Sampling, Analytical techniques, Administrative agencies.

Medical aspects of and recommendations regarding childhood lead poisoning were discussed. The Public Health Service made the following recommendations: (1) screening programs for the prevention and treatment of lead poisoning (plumbism) in children include all those who are 1 to 6 years of age and living in old, poorly maintained houses; (2) blood lead determinations be used in screening for the detection of lead poisoning and excessive absorption of lead; (3) all children found to have a blood lead concentration of 80 micrograms or more per 100 ml of whole blood, regardless of the presence or absence of clinical symptoms or of other laboratory findings, be considered as having unequivocal cases of lead poisoning and that they be handled as medical emergencies (they should be hospitalized immediately for chelation therapy); (4) all children who are found in screening programs to have lead values of 50-79 micrograms per 100 ml of whole blood should be referred immediately for evaluation as having possible cases of lead poisoning; (5) where resources permit, all children who in screening programs are found to have blood values of 40-49 micrograms/100 ml of whole blood should be recalled immediately for evaluation; (6) sources of lead must be removed from the environment of children who have lead poisoning or who have absorbed hazardous amounts of the poison in their blood. (Jernigan-Vanderbilt)
W75-08077

SELECTIVE WITHDRAWAL FROM THE LA FARGE RESERVOIR FOR DOWNSTREAM TEMPERATURE CONTROL,
Wisconsin Univ., Madison. Water Resources Center.
P. D. Uttormark, J. W. Mason, and T. L. Wirth.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 45-76. 6 fig, 3 tab, 8 ref, 3 append.

Descriptors: *Water temperature, *Downstream, *Reservoir releases, Wisconsin, Rivers, Hydrogen sulfide, Control systems, Reservoir operation, Stream fisheries, Theoretical analysis, Hypolimnion, Streams, Zone of aeration.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

To determine the feasibility of utilizing selective water withdrawal from the proposed La Farge Reservoir on the Kickapoo River in Wisconsin to control temperatures in the river below in a manner beneficial to cold-water fish and other aquatic life, water temperature, streamflow data, and time of travel studies were made on the Kickapoo River and eight tributary streams which merge with the main stream below the dam site. Using a temperature release schedule developed with the Army Corps of Engineers to predict downstream temperature effects, it was estimated that water temperatures suitable for cold-water fish species can be maintained in the river from the damsite to at least Viola or to the confluence with the west branch of the Kickapoo above Readstown, but there are some potential detrimental effects associated with a bottom-water discharge from the impoundment--dissolved oxygen sag and prevention of hydrogen sulfide releases. Selective withdrawal of water should be utilized to control water temperature, and a release schedule of water is proposed. A small power dam located 1.3 miles below the dam should be removed. A hypolimnetic aeration system for the reservoir would be beneficial. A post-impoundment monitoring system should be undertaken. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08160

COST OF ESTABLISHMENT AND OPERATION OF WATER IMPROVEMENT PROCEDURES,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
For primary bibliographic entry see Field 6G.
W75-08169

EPA AUTHORITY AFFECTING LAND USE,
Ross, Hardies, O'Keefe, Babcock and Parsons, Chicago, Ill.
F. P. Bosselman, D. A. Feurer, and D. L. Callies.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-235 331, $7.00 in paper copy, $2.25 in microfiche. Prepared for Office of Planning and Evaluation, Environmental Protection Agency, Washington, D.C., Final report No EPA 230/3-74-012, March 12, 1974, 194 p, 2 tab. BOA 68-01-1560.

Descriptors: *Land use, *Land management, *Environmental effects, *Legislation, *Clean Air Act, Environmental control, Governmental interrelations, Water Quality Act.
Identifiers: *Noise Control Act, *Solid Waste Disposal Act.

Evaluation of the legislative basis for involvement of EPA with land use decision making and control processes of the states is presented. By use of land control measures, EPA could achieve their statutory goals set forth in the Clean Air Act, the Marine Protection Research and Sanctuaries Act, the Noise Control Act, the Solid Waste Disposal Act. The direct relationship between land utilization and environmental impacts is evident; the challenge to EPA is to establish a flexible program to integrate their objectives with state and local environmental and land use regulations and agencies. Evaluation of the relative merits of one land use program against others is included. Present EPA regulations concerning air, water and noise pollution and disposal of solid wastes have great impact on land use patterns. The impact of these programs on land use as well as the relative difficulty of their being implemented are described. Methods exist to coordinate government policies to find the optimal solution to conflicts posed by uncoordinated environmental control programs. An examination of some planning and management techniques concludes that although significant benefits could be derived, their ability to provide necessary coordination is limited. (Salzman-North Carolina)
W75-08172

AREA-WIDE COMPREHENSIVE WATER AND SEWER PLAN: VOLUME I, GENERAL REPORT,
Caldwell (Robert W.) and Associates, Bryan, Tex.
For primary bibliographic entry see Field 5D.
W75-08181

AREA-WIDE COMPREHENSIVE WATER AND SEWER PLAN: VOLUME 2, TECHNICAL REPORT,
Caldwell (Robert W.) and Associates, Bryan, Tex.
For primary bibliographic entry see Field 5D.
W75-08182

WATER QUALITY MANAGEMENT PLAN--SUMMARY REPORT,
Department of Metropolitan Development, Indianapolis, Ind. Div of Planning and Zoning.
For primary bibliographic entry see Field 5D.
W75-08187

WATER QUALITY MANAGEMENT PLAN (APPENDIX E - VOLUME 3), WASTEWATER COLLECTION AND TREATMENT RECOMMENDATIONS FOR BOONE AND HAMILTON COUNTIES,
Department of Metropolitan Development, Indianapolis, Ind. Div. of Planning and Zoning.
For primary bibliographic entry see Field 5D.
W75-08188

PREDICTING VERTICAL MOVEMENT OF MANURIAL NITROGEN IN SOIL,
Cornell Univ., Ithaca, N.Y. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W75-08192

ON THE MEASUREMENT OF ENVIRONMENTAL IMPACTS OF PUBLIC PROJECTS FROM A SOCIOLOGICAL PERSPECTIVE,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6G.
W75-08203

WATER AND THE ENERGY CRISIS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W75-08210

DATA REQUIREMENTS OF A WATER QUALITY MANAGEMENT PROGRAM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, and L. R. Freeman.
Water Resources Bulletin, Vol 9, No 6, p 1234-1248, December 1973. 2 fig, 19 ref. EPA Project 1609 HDJ.

Descriptors: *Water quality control, *Management, *Planning, Pollution abatement,

Research, Regulation, Streams, Standards, Projects.
Identifiers: *Data needs, *Data requirements, Data acquisition, Routine surveillance data, Legal enforcement, Technical assistance, Water programs.

Routine data collection currently consumes a large amount of the total resources devoted to water quality management. Too often, data collection becomes an end in itself, with little thought given to the purpose of the data collection. The problem usually stems from a lack of proper routine surveillance system design and a failure on the part of the designers to initially identify the data needs of the management program. This study attempts, in a general way, to delineate the data needs of a water quality management program. This first required an identification of the activities involved in water quality management; these were broken down into the broad functions of prevention and abatement. The activities were then discussed in terms of the types of information needed to successfully complete their assigned tasks. Several detailed examples are given. Discussion results are summarized and several strategies are proposed to relate the results to surveillance system design. (Bell-Cornell)
W75-08213

A NOTE ON COST-EFFECTIVENESS IN DATA ACQUISITION IN WATER QUALITY MANAGEMENT,
Vandkvalitetsinstitut, Soborg (Denmark).
K. S. Nielsen, N. Friborg, and M. Bundgaard-Nielsen.
Water Resources Research, Vol 11, No 2, p 357-358, April 1975. 2 fig, 1 ref.

Descriptors: *Water quality, *Management, *Sampling, *Costs, Equations, Effluents, Monitoring, River basins, Optimization, Constraints, Algorithms, Systems analysis, Mathematical models.
Identifiers: *Cost-effectiveness, Data acquisition, Uncertainty, Denmark, Independent variables, Sensitivity, *Mixed integer programming, Cost minimization.

An iterative procedure for sampling in water quality management is presented. The procedure, which utilizes constrainted mixed integer programming, establishes a relationship between cost of sampling and relative uncertainty in total discharge into the water system and at the same time provides an optimal frequency matrix for sampling. The frequency of sampling at each discharge is treated as an independent variable. (Bell-Cornell)
W75-08214

SALINITY CONTROL AND FEDERAL WATER QUALITY ACT,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
M. B. Bessler, and J. T. Maletic.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings paper No. 11321, p 581-594, May 1975. 6 fig, 1 tab, 17 ref.

Descriptors: *Salinity, *Water quality control, *Colorado River, *Water management(Applied), Water resources development, *Comprehensive planning, Standards, Economic impact, Evaluation, River basins, Simulation analysis, Computer models, Constraints, Mathematical models, Systems analysis, Federal jurisdiction, Southwest US.
Identifiers: *Salinity control.

Salinity as a mineral pollutant is receiving increased attention in the Western U.S. in terms of economic impacts. The salinity control problem on the Colorado River is examined in relation to the Federal Water Quality Act, PL 92-500. Even basin-wide salinity controls as presently envisioned will not be able to meet anticipated salinity standards and the 'zero discharge' goals of the Act. Described is the Colorado River Water Quality Improvement Program (CRWQIP), only one element of an entire matrix of management plans in the Colorado River Basin. CRWQIP has five categories of control under present study: river system management; point source control; diffuse source control; irrigation source control; and return flow utilization. Options that may be required for the present nondegradation policy are: minimize deep percolation losses from irrigation; desalt return flow and divert brine stream from the system; desalt water prior to select use; divert and reuse saline flows for nonagricultural use; and combinations of foregoing. Discussed is the use of the Colorado River Simulation Model. A new planning strategy of total water management is suggested to identify and evaluate water needs, water resources, physical technology, management technology, and other nonphysical constraints. Thus, specific economic limitations and institutional constraints identified under the various management options will assist in setting attainable salinity levels within a river basin in lieu of meeting rigid zero discharge limitations for each user. Systems analysis tools are advocated for comprehensive basinwide management. (Bell-Cornell)
W75-08217

LAND-BASED MODELING SYSTEM FOR WATER QUALITY MANAGEMENT STUDIES,
Gates (W. E.) and Associates, Inc., Cincinnati, Ohio.
W. M. Grayman, R. M. Males, W. E. Gates, and A. W. Hadder.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY5, Proceedings paper No. 11327, p 567-580, May 1975. 6 fig, 4 ref.

Descriptors: *Water quality control, *Management, *Computer models, *Comprehensive planning, *Land use, Design, *Treatment facilities, Sewers, Networks, Waste water(Pollution), Environmental control, Rivers, Costs, Alternative planning, Optimization, Simulation analysis, Systems analysis, *Virginia.
Identifiers: *James River(Virginia), Least cost.

Only recently has water quality planning begun to focus on the relationship between land use and waste management. The system of land use/development, waste generation transport-treatment, and the aquatic environment must be considered as a whole in water quality planning for which comprehensive planning tools are required. In response to this need, a computer system called ADAPT (Areal Design and Planning Tool) has been developed. ADAPT is composed of a highly accessible large data file and a series of mathematical submodels which facilitate the storage and use of spatially arrayed data. Though originally implemented as part of a large water quality management study of the lower James River in Virginia where it was used in a variety of land-use/development and sewer/treatment plant design tasks, its flexible structure makes it broadly applicable to a wide range of environmental planning concerns. The basic structure of ADAPT is described together with a discussion of its application to the James River. (Bell-Cornell)
W75-08218

THE RECLAMATION OF SULFURIC ACID FROM WASTE STREAMS,
New Jersey Zinc Company, Palmerton, Pennsylvania. Research Department.
For primary bibliographic entry see Field 5D.
W75-08228

COPPER RECOVERY FROM BRASS MILL DISCHARGE BY CEMENTATION WITH SCRAP IRON,
Anaconda American Brass Co., Waterbury, Conn.
For primary bibliographic entry see Field 5D.
W75-08229

THOSE ELUSIVE 1985 WATER QUALITY GOALS.
Professional Engineer, Vol 44, No 3, p 30-31, March 1974. 2 p, 3 fig.

Descriptors: *Water pollution control, Pollution treatment, *Water quality control, *Government finance, Federal government, Federal Water Pollution Control Act, Industrial wastes, Industrial water, Costs, Cost analysis, Cost trends, Research and development, Research priorities.
Identifiers: Federal Water Pollution Control Act Amendments of 1972, Estimated costs, *Installation costs.

It is doubtful that the federal government will meet the 1985 water quality goals incorporated into the 1972 amendments to the Federal Water Pollution Act. The prime cause is an under expenditure of funds for research and developmenta, a shortchanging which will lead to a technological inability to achieve these water quality goals. There are seven areas in which improvements are required if the goals are to be reached: (1) research to determine how pollutants get into the water, what happens to them, and what is their effect; (2) minimizing the cost of treating municipal sewage; (3) necessary technology to control pollution from industrial and nonpoint sources; (4) need for a water pollution reseach and development strategy; (5) making the research and development program of the Environmental Protection Agency more responsive to operating programs; (6) need for national plans to improve coordination of water pollution research and development; and (7) need for a federal focal point to coordinate the dissemination of research information. The office of Management and Budget should attempt to obtain the full cooperation and support of all federal agencies engaged in water pollution research in the development and implementation of a comprehensive national research and development plan. (Gerlach-Florida)
W75-08233

CHLOR-ALKALI PRODUCERS SHIFT TO DIAPHRAGM CELLS,
For primary bibliographic entry see Field 3E.
W75-08235

JAPAN'S FISHERMEN FORCE CHLORINE MAKERS TO SWITCH.
Chemical Week, Vol 113, No 5, p 31-32, August, 1973. 2 photos.

Descriptors: *Mercury, *Industrial wastes, *Regulations, *Public health, Toxicity, Fish, Chlorides, Legal aspects.
Identifiers: *Japan.

As a result of the latest fish poisoning furor in Japan, the government ordered chlorine producers to end all discharges from mercury-cell plants and switch to diaphragm cells by September, 1975. The Japanese Ministry of International Trade and Industry's order came after investigation of an outbreak of organic mercury poisoning on the coast of the Sea of Ariake. Protest marches in Tokyo and a blockade by fishing boats of the port used by the Chisso Corporation acetylene plant were instrumental in prompting government action. The Japanese industries are now seeking U.S. technology and assistance in order to comply with the new regulations. (Jernigan-Vanderbilt)
W75-08236

THE PROTECTION OF NATURE AS REFLECTED IN THE WORK OF THE FIRST UNITED NATIONS CONFERENCE OF THE ENVIRONMENT (STOCKHOLM, 1972), (IN ROMANIAN),
Consililul National al Apelor, Bucharest (Rumania).
For primary bibliographic entry see Field 6G.
W75-08241

STANDARDS FOR FAECAL COLIFORM BACTERIAL POLLUTION: COMMENT AND REPLY,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
I. L. Vidal, A. A. Collins, and M. Loutit.
N Z J Mar Freshwater Res, Vol 6, No 1/2, p 214-219, 1972.
Identifiers: *Bacteria, Coliforms, *Fecal coliforms, *New Zealand, *Water quality standards, Water pollution, Recreation.

Vidal and Collins argue in favor of separate standards for recreational water of various regions in New Zealand. This suggestion is disputed by Loutit in a short commentary; and then refuted in a reply by Vidal and Collins.--Copyright 1973, Biological Abstracts, Inc.
W75-08254

PREDICATION OF THE BALANCE OF MATTER IN STORAGE RESERVOIRS BY MEANS OF CONTINUOUS OR SEMICONTINUOUS BIOLOGICAL MODELS: II. RELIABILITY OF THE PREDICTION METHOD, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
J. Benndorf.
Int Rev Gesamten Hydrobiol, Vol 58, No 1, p 1-18, 1973, Illus.

Descriptors: Model studies, *Reservoirs, Reservoir storages, *Forecasting, *Balance of nature, Reliability, *Mathematical analysis, Phosphates.
Identifiers: Asterionella-formosa, Biological models, Nitzschia-acicularis, Phytoplankton.

The phosphate removal in small, completely mixed storage reservoirs (preimpoundment basins) mainly is a function of the production of biomass by the phytoplankton. The knowledge of the critical detention time of the water is the most important premise to the prediction. The critical detention time is computed from a derived equation. A comparison of the predicted results from semicontinuous cultures and from the preimpoundment basin of the Weida reservoir revealed a satisfactory degree of conformity.--Copyright 1974, Biological Abstracts, Inc.
W75-08273

NATURAL RESOURCES IN MODERN WORLD AND THE PROBLEM OF THEIR CONSERVATION, (IN ROMANIAN),
Academia R. S. R., Cluj. Centrul de Cercetari Biologice.
For primary bibliographic entry see Field 6G.
W75-08274

THE ROLE OF TRACE ELEMENTS IN MANAGEMENT OF NUISANCE GROWTHS,
Academy of Natural Sciences of Philadelphia, Pa.
R. Patrick.
Available from the National Technical Information Service, Springfield, Va, 22161 as PB-241 985, $7.50 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Ada, Oklahoma, Report EPA-660/2-75-008, April 1975. 250 p. Task 1BB045 (ROAP 21-ASJ, 02), R-800731, (Formerly 16080 FQK).

Descriptors: *Trace elements, *Algal control, Bioindicators, *Nuisance algae, Diatoms, Cyanophyta, Chlorophyta, Water pollution control, Productivity, Standing crops, *Aquatic weed control, Water pollution effects.
Identifiers: Species diversity, Aquatic ecosystems.

The purpose was to examine the effects of various kinds and amounts of trace metals on the structure of algal communities and their possible subsequent effect upon the productivity of the aquatic ecosystem. The following trace metals were examined: vanadium, Chromium, Selenium, boron, nickel, and rubidium. The results of these experiments indicate the concentration and form of a trace metal may have a definite effect upon which algal species can out-compete others. These shifts may greatly reduce the productivity of the system as a whole. If the shift is to species which have lower predator pressure, large standing crops which may be nuisances may develop. (EPA)
W75-08278

PROCEEDINGS: RESEARCH PLANNING CONFERENCE ON INTEGRATED SYSTEMS OF AQUATIC PLANT CONTROL 29-30 OCTOBER 1973.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-08289

BIOLOGICAL CONTROL OF WATER HYACINTH WITH INSECT ENEMIES.
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 4A.
W75-08290

A BACTERIOLOGICAL SURVEY OF THE LITTLE RIVER, SOUTH CAROLINA- CALABASH CREEK, NORTH CAROLINA AREA.
Environmental Protection Agency, Athens, Ga. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5B.
W75-08302

WATER QUALITY AND WASTE SOURCE INVESTIGATIONS. MISSOURI RIVER AND KANSAS RIVER, KANSAS CITY, KANSAS.
Environmental Protection Agency, Kansas City, Mo. Region VII.
For primary bibliographic entry see Field 5B.
W75-08307

THE BREACH IN THE FLOW OF MINERAL NUTRIENTS,
For primary bibliographic entry see Field 5B.
W75-08319

EXTRACTION OF SOIL SOLUTION FROM FLOODED SOIL USING A POROUS PLASTIC FILTER,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
L. R. Hossner, and D. P. Phillips.
Soil Sci, Vol 115, No 1, p 87-88, 1973, Illus.
Identifiers: *Extraction, Filter, *Flooded soils, *Iron, *Manganese, *Phosphorus, Plastics, Porous filters, Soil solution.

The concentration of Fe, Mn and P extracted from a series of soils with varying concentration of these elements is shown. These data are plotted against those values obtained by pulling solution from the soils on the same day using a Buchner funnel and vacuum flask. In general, concentrations of Fe, Mn and P obtained by the 2 methods were comparable. There was a tendency for slightly lower Fe concentrations in solution when the solution was extracted with the plastic filter particularly when the Fe concentration exceeded about 40 ppm. This method of extraction allows for periodic sampling of the same container for an element over an extended period of time. Concentrations of Fe, Mn and P in the soil solution of an Edna clay loam during 36 days of flooding are shown. The characteristic increases in the solution concentration of Fe and Mn with time can be seen. Mn is reduced at a higher reduction potential then Fe and increases in solution first followed by a rapid increase in the concentration of soluble Fe. P concentration in this soil was low throughout the flooding period and never increased above 0.10 ppm.--Copyright 1973, Biological Abstracts, Inc.
W75-08335

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL MONTHLY OPERATION OF INTERCONNECTED HYDROELECTRIC POWER STORAGES,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W75-07898

AN INTERDISPLINARY APPROACH TO DEVELOPMENT OF WATERSHED SIMULATION MODELS,
British Columbia Univ., Vancouver. Inst. of Animal Resource Ecology.
For primary bibliographic entry see Field 2A.
W75-07947

A STOCHASTIC DYNAMIC PROGRAMMING MODEL FOR THE OPTIMUM OPERATION OF A MULTI-PURPOSE RESERVOIR,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W75-07988

ON THE MOISTURE BETWEEN DATA AND MODELS OF HYDROLOGIC AND WATER RESOURCE SYSTEMS,
Arizona Univ., Tuscon. Dept. of Management.
J. E. Weber, C. C. Kisiel, and L. Duckstein.
Water Resources Bulletin, Vol 9, No 6, p 1075-1088, December 1973. 1 fig, 26 ref. OWRT C-3259(No 3708)(5) NSF Grants GK34014, GK35915.

Descriptors: *Model studies, *Data collections, *Regression analysis, *Forecasting, *Planning, Water resources development, Hydrology, Estimating, Evaluation, Analytical techniques.
Identifiers: *Multiobjective problem, Secondary data, Proxy variables, Multicriterion problem.

Many difficulties exist in the matching of models with data. Elements of this problem were identified and considerations involved in model evaluation were discussed. The well known multivariate linear regression model was used to illustrate the distinctions between accuracy and precision and between estimation and prediction (because the model is commonly misused). No amount of additional data will improve the accuracy of a poor model. A high correlation coefficient, while indicative of a good matching between the observed data and model estimates, is a poor criterion for judging adequacy of the model to make good predictions of future events. Model evaluation also includes the problem of introducing secondary data and proxy variables into a model. Secondary data frequently enter, for example, the mass, energy, and budget equations, because of difficulties in measuring the primary variables. Proxy variables arise because of a desire to collapse a vector of incomparable values, say, of water quality into a single number. Review of the above issues indicated that model evaluation is a multicriterion problem, often imbedded in a larger framework where models are intended to

meet multiple objectives. The mismatch of models and data has increasing legal and social consequences. (Singh-ISWS)
W75-07989

A DYNAMIC WATER AND RELATED LAND RESOURCE PLANNING MODEL: ITS APPLICATION TO AN HAWAIIAN WATER SYSTEM,
Hawaii Univ., Honolulu. Water Resources Research Center.
T. Liang, W.-Y. Huang, and I-P. Wu.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 937, $4.25 in paper copy, $2.25 in microfiche. Technical Report No 81, July 1974. 55 p, 14 fig, 18 ref. OWRT A-038-HI(1), 14-31-0001-3811 and 14-31-0001-4011.

Descriptors: *Computer models, *Linear programming, *Land use, Water resources, Crops, *Irrigation, Management, Reservoirs, *Hawaii, Planning, *Optimum development plans, Land resources, Model studies, Optimization, Water distribution(Applied).
Identifiers: Multiple cropping, Efficient land use.

Planning an optimal system of activities for generating economic goods and services within an existing natural resource capacity is a difficult problem. A mathematical programming model with the capacity to check multiple resource demand and supply compatibility over many time periods was developed as a solution to this type of problem. The characteristics of natural resource supply and the demand of activities were utilized to reduce the number of time periods and to minimize the loss of the dynamic reality of the problem. Reduction in the number of time periods extended the capability of the model in solving complex resource planning problems without oversimplification. The advance in computer memory size and speed has made multi-period mathematical programming models a practical and desirable tool in planning optimal production scheduling and optimal allocation of resources. However, the construction of a large constraint matrix generated by multi-period models remains an obstacle to the use of multi-period linear programming (LP) models. A matrix generator capable of dividing time span according to resource characteristics and IBM-MPS output compatible matrix for LP otimization was developed.
W75-07993

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: IRRIGATED AGRICULTURE WATER USE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-07994

WATER RESOURCES PLANNING, SOCIAL GOALS AND INDICATORS: METHODOLOGICAL DEVELOPMENT AND EMPIRICIAL TEST.
Utah State Univ., Logan. Technical Committee of the Water Resources Research Center of the Thirteen Western States.
For primary bibliographic entry see Field 6B.
W75-07997

OPTIMAL COST DESIGN OF BRANCHED SEWER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-07999

THE IMPACT OF HIGH INTEREST RATES ON OPTIMUM MULTIPLE OBJECTIVE DESIGN OF SURFACE RUNOFF URBAN DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W75-08001

DEVELOPING BIOLOGICAL INFORMATION SYSTEMS FOR WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-08002

AN OPTIMAL POLICY FOR OPERATING A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C.
For primary bibliographic entry see Field 4A.
W75-08003

FLOOD PROTECTION BENEFITS AS REFLECTED IN PROPERTY VALUE CHANGES,
Kentucky Univ., Lexington. Dept. of Economics.
For primary bibliographic entry see Field 6F.
W75-08004

WATER QUALITY CONTROL BY ARTIFICIAL AERATION OF STREAM RECEIVING THERMAL AND ORGANIC WASTE DISCHARGES,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W75-08005

DIGITAL SIMULATION OF THE EFFECT OF THERMAL DISCHARGE ON STREAM WATER QUALITY,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-08006

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W75-08007

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

PLANNING THE TEHACHAPI CROSSING,
Burns and Roe, Inc., Sacramento, Calif.
A. R. Golze.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY1, Proceedings paper No. 11052, p 1-16, January 1975. 7 fig, 1 tab, 10 ref.

Descriptors: *Planning, *Hydraulic models, California, *Aqueducts, *Pumps, *Earthquakes, Pumping, Projects, Water delivery, Water supply, Design, Construction.
Identifiers: *California Water Project, *Water tunnels, Tehachapi Mountains(California).

The Tehachapi Crossing of the California Water Project represents a definite advancement in the art of planning, designing, and constructing high-head pumping facilities in North America; it demonstrates the benefits obtainable from a well-planned and-executed research and development program in water transportation. The planning of the California Aqueduct crossing of the Tehachapi Mountains in California north of Los Angeles involved 10 years of intensive research and study in the United States and Europe to design a 4,100-cfs (116,112 l/s), 2,000-ft (610m) high-head pump lift, the largest in the U.S. Engineering examination of alternate aqueduct routes over the high mountain ranges ended in selection of a crossing at El. 3100 (945.5m). Study of the number of pump lifts was resolved in favor of a single-lift on the Ridge Route. Model tests of various types of European and American pump designs identified as most suitable a vertical four-stage single-flow centrifugal pump 33 ft (10.065m) in height, 16 ft (4.88m) in diameter. Ten miles of 23.5-ft (7.18m) diameter tunnel convey the pumped water through the mountain range. The Tehachapi Crossing has been in operation since October 1971. (Bell-Cornell)
W75-08201

ON THE MEASUREMENT OF ENVIRONMENTAL IMPACTS OF PUBLIC PROJECTS FROM A SOCIOLOGICAL PERSPECTIVE,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6G.
W75-08203

CREATIVITY AND RATIONALITY IN PLAN FORMULATION,
Hydrologic Engineering Center, Davis, Calif. Planning Analysis Branch.
For primary bibliographic entry see Field 6B.
W75-08205

USER--ORIENTED RESEARCH DESIGNS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr., and K. E. Stork.
Water Resources Bulletin, Vol 10, No 3, p 440-446, June 1974.

Descriptors: *Water resources, *Research, Design, Planning, Technology, Social aspects, Projects, Priorities.
Identifiers: *User-oriented research, *Technology transfer.

The traditional approach to water resources problem solving has been technical. Today, however, problems originate more often from ineffective institutions or techniques for planning, management and regulation than from inadequacies or lack of physical works. A user-oriented research plan for water resources is presented. Its principal components are: (1) a mechanism for identifying social goals and translating them into research objectives; (2) procedures for setting priorities; (3) a program planning technique for designing projects to have impact on important research objectives; (4) a mechanism for coordinating research activities of important research producers; (5) a structure for encouraging and establishing interdisciplinary team efforts when they are required; (6) a well-coordinated technology transfer plan; and (7) an effective method for promoting and sustaining user-researcher cooperation. Both basic and applied research designs are examined and criteria presented. The implementation of research plans is also discussed and various factors which play a role in implementation are outlined, including: coordination, goal interpretation and priority setting, project planning, project review, interdisciplinary considerations and the user-researcher interface. (Bell-Cornell)
W75-08206

A NOTE ON COST-EFFECTIVENESS IN DATA ACQUISITION IN WATER QUALITY MANAGEMENT,
Vandkvalitetsinstitut, Soborg (Denmark).
For primary bibliographic entry see Field 5G.
W75-08214

ECOLOGICAL AND ECONOMIC PRINCIPLES IN PARK PLANNING: THE ASSATEAGUE NATIONAL SEASHORE MODEL,
National Park Service, Washington, D.C.
For primary bibliographic entry see Field 6B.
W75-08216

SALINITY CONTROL AND FEDERAL WATER QUALITY ACT,
Bureau of Reclamation, Denver, Colo. Water Quality Office.
For primary bibliographic entry see Field 5G.
W75-08217

LAND-BASED MODELING SYSTEM FOR WATER QUALITY MANAGEMENT STUDIES,
Gates (W. E.) and Associates, Inc., Cincinnati, Ohio.
For primary bibliographic entry see Field 5G.
W75-08218

INTERACTIVE SIMULATION FOR WATER SYSTEM DYNAMICS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08219

6B. Evaluation Process

IDENTIFICATION AND ANALYSIS OF SELECTED HIGH PRIORITY WATER PROBLEMS AND RELATED RESEARCH NEEDS OF THE MISSOURI RIVER BASIN,
Nebraska Univ., Lincoln. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 945, $5.25 in paper copy, $2.25 in microfiche. Completion Report, Missouri River Basin Water Institute Consortium, March 1975, 125 p. OWRT X-135(No 9079)(1), 14-31-0001-9079.

Descriptors: Evaluation, Research and development, Cost analysis, *Research priorities, *Regional analysis, Planning, *Missouri River, Riber basin development, *Coordination, *Alternative planning, Water resources development, Reservoir operation.
Identifiers: *Research needs, Research problems.

In 1972 the Water Institutes in the ten states of the Missouri River Basin formed a Consortium for coordinating research planning and implementation with regard to regional problems. The objectives were to: (1) identify principal water resources problems of the Missouri River Basin; (2) determine the most reasonable alternatives for solving these problems; (3) identify research needed to permit cost-effective solutions; (4) evaluate mechanisms to implement the needed research; and (5) assign priorities, estimate costs and evaluate funding opportunities. During 1973 each state in the Basin was requested to conduct a state workshop to determine regional research needs and problem identification. A regional workshop was held, during which 23 research problem areas in the Basin were identified. This list was revised and evaluated during 1974 meetings of MRBWIC Directors, and a list of 10 problem areas was delineated. Each Institute Director was assigned to analyze one problem area. Again state workshops were held on many of the specific problem areas. These results were again tabulated by MRBWIC Directors and a final reassessment of research priorities for the Missouri River Basin showed six principal categories as follows: (1) source and adequacy of water for energy production; (2) irrigation systems; (3) evapotranspiration; (4) flood plain management; (5) sediment; and (6) reservoir management.
W75-07851

WATER FACTS AND FIGURES FOR PLANNERS AND MANAGERS,
Geological Survey, Menlo Park, Calif.
J. H. Feth.
Circular 601-I, 1973. 30 p, 9 fig, 8 tab, 22 ref.

Descriptors: *Water management(Applied), *Urban hydrology, Hydrology, *Water resources, Thesauri, Water properties, Water measurement, Surface waters, Groundwater, Water quality, Education, *Documentation, *Classification.

This circular is intended to provide the basic information that goes into management considerations of water. It is concerned mostly with the language used in dealing with water. Terminology, numbers, and equivalents are mainly presented; theory and principles are briefly mentioned. Water terms are presented together with a suggestion of their significance and interrelations. (Knapp-USGS)
W75-07889

FLOOD PLAIN MANAGEMENT AND IMPLEMENTATION STRATEGIES FOR FPM PROGRAMS,
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6F.
W75-07890

MODAL CITIES,
Dartmouth Coll., Hanover, N.H. Dept. of Geography.
J. W. Sommer, and G. B. Pidot, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-239 719, $4.25 in paper copy, $2.25 in microfiche. Environmental Protection Agency, Report EPA-600/5-74-027, October 1974. 55 p, 9 fig, 9 tab. EPA Program Element 1HA096, 801226.

Descriptors: *Cities, Analytical techniques, Urbanization, Regional analysis, Model studies, Human population.
Identifiers: *Modal cities, *Components analysis, Modalities, Standard metropolitan statistical area.

Model cities are representative cities based on a specific set of criteria. Using principal components analysis, 224 U.S. SMSA's (Standard Metropolitan Statistical Areas) were examined in terms of 48 selected variables. This analysis yielded 14 dimensions, of which 7 explained 67% of the variance. The 224 cities were then grouped using a method that minimizes the differences among cities within a group and maximizes the differences across groups. This procedure allowed for a confident selection of 9 modalities of the U.S. metropolitan system. Each city fell into a modality and was ranked relative to its distance from the mean. The two cities closes to the mean were taken as representative of that group. One unforeseen result of this research was the distinct regional character of the different groupings. (EPA)
W75-07967

IMPROVING PRODUCTIVITY IN LOW RAINFALL AREAS.
Food and Agriculture Organization of the United Nation, Rome (Italy). Committee on Agriculture.
For primary bibliographic entry see Field 3F.
W75-07981

ECONOMIC AND INSTITUTIONAL ANALYSIS OF COLORADO WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-07992

A DYNAMIC WATER AND RELATED LAND RESOURCE PLANNING MODEL: ITS APPLICATION TO AN HAWAIIAN WATER SYSTEM,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W75-07993

THE LITERATURE CITED IN THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES PUBLICATIONS ON WATER RELATED SUBJECTS, 1964-1973,
Wisconsin Univ., Madison. Library School.
For primary bibliographic entry see Field 10D.
W75-07996

WATER RESOURCES PLANNING, SOCIAL GOALS AND INDICATORS: METHODOLOGICAL DEVELOPMENT AND EMPIRICIAL TEST.
Utah State Univ., Logan. Technical Committee of the Water Resources Research Center of the Thirteen Western States.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-242 025, $8.50 in paper copy, $2.25 in microfiche. Report PRWG-131-1, Utah Water Research Laboratory, Utah State University, Logan, December 31, 1974. 261 p, 43 fig, 18 tab, 114 ref. OWRT C-4330(No 9049)(1).

Descriptors: *Planning, *Social Values, *Decision making, *Water policy, *Welfare(Economics), *Evaluation, Social aspects, Federal government, Model studies, Intangible benefits, Conservation, Recreation, Aesthetics, Water resources development, Policies, Environment, Methodology, Attitudes, Social participation.
Identifiers: *Social indicators, *Social goals, Well-being, Policy action, Public participation.

A methodology for comprehensive evaluation of water resources development and use (TECHCOM) has been developed and partially field tested. A model of 3 societal goals consists of nine primary goals successively articulated into increasingly specific subgoals consists of nine primary goals successively articulated into increasingly specific subgoals. Achievement of subgoals is perceived as affected by measurable social indicators whose values are perturbed by water resources actions. Linking the elements of the goal taxon by connectives results in an evaluation system. Historical, political and philosophical considerations of the proposed system are discussed in Part I. Part II describes the results of the Rio Grande of New Mexico test including public perception and weighting of the subgoals and goals, and development of specific connectives. Future values of 128 social indicators for 5 action plans for four five-year intervals to 1987 are estimated using a computerized system based on an inversion of an input-output model interacting with social and environmental indicator connectives. A computerized system for quantified planning inquiry provides comparisons of relative goal achievement and permits review of all planning information through a simple retrieval procedure providing visual display or hard copy. The methodology is conceived as applicable generally to natural resources actions.
W75-07997

AN OPTIMAL POLICY FOR OPERATING A MULTIPURPOSE RESERVOIR,
Clemson Univ., S.C.
For primary bibliographic entry see Field 4A.
W75-08003

WATER QUALITY MANAGEMENT AND INFORMATION SYSTEMS,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 5G.
W75-08007

RIVER BASIN WATER PLANNING ORGANIZATIONS IN THE 60'S,
Utah State Univ., Logan. Dept. of Civil Engineering.
D. H. Hoggan.
Water Resources Bulletin, Vol 10, No 6, p 1173-1186, December, 1974. 1 fig, 2 tab, 11 ref. OWRT C-2089(No 3671)(2).

Descriptors: *River basins, *River basin commissions, *River basin development, *Inter-agency cooperation, *Planning, Organizations, Comprehensive planning, Rivers, U.S. Water Resources Council.
Identifiers: Inter-agency river basin planning, Regional planning studies.

The experience of 15 state-federal interagency river basin studies is examined. The Water Resources Council envisioned framework studies (Type 1) for large multi-state areas while Type 2 studies were to provide a basis for authorization for projects to begin during the next 10-15 years. Essentially Army Corps of Engineer studies, Type 2 studies represent a significant step in coordination with other agencies. Usually with the Corps as lead agency, study contributors collected large amounts of unused data without formulating objectives or early hypotheses. Growing public interest in citizen participation and multi-objective planning complicated the task, as did the 1969 requirement of Environmental Impact Statements. A general lack of commitment to cooperative comprehensive planning and a lack of central administration and funding increased organizational difficulties. Type 2 studies, unable to plan in sufficient detail to provide specific plans due to organizational, time, and financial constraints, were classified Level B studies (preliminary or reconnaissance level) by the Council in 1970 under a new policy which established levels of planning in lieu of types of planning. Conclusions: (1) Focus should be on the total system of a geographically designed planning area instead of on separate development purposes, with a centralized planning staff and centralized funding. (2) Conceptual plans and public participation should be included in early planning stages. (3) Planning should be a continuous process with adjustment for dynamic conditions and mechanisms for comprehensive implementation. (4) Guidelines for organizing river basin studies and criteria for evaluating planning are badly needed. (5) Formal training programs in planning skills will improve leadership and staff capabilities. (Herr-North Carolina)
W75-08011

A BASIS FOR ASSESSING DIFFERENTIAL PARTICIPATION IN WATER-BASED RECREATION,
Washington State Water Resources Center, Pullman.
D. R. Field, and N. H. Cheek, Jr.
Water Resources Bulletin, Vol 10, No 6, p 1218-1227, 1974. 5 tab, 22 ref. OWRR A-047-WASH(3).

Descriptors: *Recreation, *Psychological aspects, *Attitudes, Social aspects, *Social participation, Alternative planning, Evaluation.
Identifiers: Public participation.

Participation in water-based recreation activities does not arise in random fashion nor is it simply the result of having a water resource immediately available. Neither do individuals and groups engage in the same activities or a specific activity in the same way. This study describes an alternative framework whereby differences among recreation users can be identified as opposed to studies assuming that recreation activity is site specific. Investigations of designated activity spots disclosed that the largest proportion of human action observed was not related to, or dependent on the recreational activity for which the area might have been designed. Rather recreation areas are defined by users as leisure places instead of activity sites. Similarities are noted of leisure places in terms of the presence or absence of specific recreation activities. It is when recreation sites are considered as leisure settings where people gather in groups, distinguishing features of recreation activities become evident. The study was based on social groups subdivided into friendship groups, family units, and mixed, a combination of family and friends, and utilized a portion of the data compiled by the National Park Service and the Washington State Water Resources Center. (Auen-Wisconsin)
W75-08012

WRINGING OUT THE WEST, REMEMBER THE MISSOURI AND THE COLORADO,
For primary bibliographic entry see Field 6D.
W75-08101

RECREATION USES CHANGE MOGOLLON RIM ECONOMY,
Forest Service (USDA), Tucson, Ariz. Rocky Mountain Forest and Range Experiment Station; and Arizona Univ., Tucson.
R. S. Boster, P. F. O'Connell, and J. C. Thompson.
Arizona Review, Vol 23, Nos 8-9, August-September, 1974. 5 p, 3 fig, 1 tab.

Descriptors: *Water supply, *Land use, *Recreation demand, *Arizona, *Environmental effects, Economic impact, Water pollution, Waste water treatment, Land development, Recreation wastes.
Identifiers: *Mogollon Rim(Ariz).

Located less than 100 miles from Phoenix, Arizona, the Mogollon Rim country is experiencing rapid and uncontrolled growth and development. Private lands in the area have historically been used for grazing and crop production. Recently, these practices have become uneconomical and land owners are turning to residential development, particularly summer home construction and facilities for transient recreationists. Development of these private lands is creating management problems for adjacent National Forests through increased demands for services such as fire protection and water supplies. In addition, evidence of environmental degradation is present, primarily water pollution resulting from inadequate or nonexistent waste treatment systems. Land use planning along with private land and Forest Service cooperation are viewed as steps to the solution of a complex problem. (Mastic-Arizona)
W75-08108

AN INTEGRATED NATURAL RESOURCES SURVEY IN NORTHERN IRAQ,
Institute for Applied Research on Natural Resources, Baghdad (Iraq).
For primary bibliographic entry see Field 3F.
W75-08116

IMPACT OF A PROPOSED IMPOUNDMENT OPERATION ON THE INVERTEBRATE ASSEMBLAGES IN THE KICKAPOO RIVER, LA FARGE (VERNON CO.), WISCONSIN,
Wisconsin Univ., Madison. Dept. of Zoology.
R. Hall, J. J. Magnuson, and W. Shaffer.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p. 129-159. 5 fig, 2 tab, 26 ref, 2 append.

Descriptors: *Benthos, *Pre-impoundment, *Invertebrates, *Post-impoundment, Aquatic insects, Oligochaetes, Wisconsin, Hypolmnion, Crustaceans, Stoneflies, Water beetles, Caddisflies, Mayflies, Diptera, Worms, Reservoirs, Snails, Rivers, Fish food organisms, Water temperature, Biomass, Stream improvement, Varieties.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

Seasonal fluctuations in invertebrate species, abundance, distribution, and diversity were examined at sites at the proposed La Farge impoundment of the Kickapoo River. Mayflies, stoneflies, caddisflies, beetles, and Diptera (true flies) were the most common organisms on the river bottom. True bugs were present along the bank. Aquatic oligochaete worms and chireonomids were in the stream. Gammarus was the most abundant crustacean. The reservoir will change the environment thus inducing changes in the benthos from lotic species to lentic fauna. Most of the present aquatic insects and crustacea will persist upstream from the impoundment. In the impoundment, some lake species will become abundant, but fluctuating water levels and possible anoxic conditions in the hypolimnion will restict distribution. Plankton will develop in the limnetic zone. Below the impoundment, some insects and plankton may appear in the discharge, many species will disappear, diversity will decline, but food supply will increase. Biomass and invertebrate production may improve near the dam. Stream improvement may be needed to insure substrates for macroinvertebrates and cover for trout. Due to the small size of the chironomids and simuliids, a viable forage fish population may reduce the smaller organisms and provide food particle sizes more suitable for trout. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08164

INITIAL COASTLINE PLAN FOR THE SAN DIEGO REGION,
Duncan and Jones, Berkeley, Calif. and San Diego County Comprehensive Planning Organization, Calif.
For primary bibliographic entry see Field 6F.
W75-08171

AREA-WIDE COMPREHENSIVE WATER AND SEWER PLAN: VOLUME I, GENERAL REPORT,
Caldwell (Robert W.) and Associates, Bryan, Tex.
For primary bibliographic entry see Field 5D.
W75-08181

WATER QUALITY MANAGEMENT PLAN--SUMMARY REPORT,
Department of Metropolitan Development, Indianapolis, Ind. Div of Planning and Zoning.
For primary bibliographic entry see Field 5D.
W75-08187

THE AMERICAN INDIAN AND MISSOURI RIVER WATER DEVELOPMENTS,
Nevada Univ., Reno. Renewable Resources Center.
B. D. Shanks.
Water Resources Bulletin, Vol 10, No 3, p 573-579, June 1974. 18 ref.

Descriptors: *Missouri River, *Water resources development, *Social aspects, *Economic impact, Land resources, Costs, Benefits, History.
Identifiers: *American Indians, *Social costs, *Cultural costs.

Considered are the social costs to the American Indian occasioned by construction of three Missouri River main stem dams (Garrison, Oahe, and Fort Randall) and related reservoir taking. Socioeconomic changes have occurred on five Indian reservations: Fort Berthold, Cheyenne River, Standing Rock, Crow Creek and Lower Brule. Inundation of Missouri River riparian lands caused the loss of important cultural, social and economic environments. Ninety percent of the reservations' timber, seventy-five percent of the wildlife and most of the fertile cropland were in the reservoir taking area. Urban and more fertile environments downstream and to the east received most of the projects benefits. The Indian minority on the five reservations received few economic and social

benefits after bearing a disproportionate share of the social and economic costs of the developments. Relocation was forced upon those who had the longest historic and cultural claim to the land. The social costs to the American Indian occasioned by the Missouri River water developments illustrate two broad areas seldom considered during the decision process: First, the unique historic, cultural or religious values of minorities affected by developments; second, the disproportionate spatial allocation of both benefits and costs. The second item includes social, economic and cultural considerations in not just a geographic framework but in a cultural framework as well. (Bell-Cornell)
W75-08204

CREATIVITY AND RATIONALITY IN PLAN FORMULATION,
Hydrologic Engineering Center, Davis, Calif. Planning Analysis Branch.
W. K. Johnson.
Water Resources Bulletin, Vol 10, No 3, p 478-485, June 1974. 3 fig, 10 ref.

Descriptors: *Planning, *Creativity, *Decision making, *Water resources development, Model studies, Alternative resources, Management, Forecasting, Systems analysis.
Identifiers: Planning process, *Plan formulation, Production function, Inventory, Rationality.

Plan formulation is both art and science; to improve formulation and to develop better alternatives, the planner needs to improve his creative capability and to think more systematically. Research into creativity by psychologist and social scientist has identified four aspects of creativity: the creative process, the creative product, the creative person, and the creative situation. A review of research results on each aspect suggests several ways in which planners can improve the creative dimension of plan formulation. To improve the rational aspects of plan formulation, a way of thinking is presented in the form of a conceptual model to assist the planner in systematically developing a broader range of plans. The major components are inventory, forecast and synthesis. The model utilizes the concept of a production function to provide information about the water resource, management practices, and the resource use. Creativity is difficult for the planner/engineer educated in the scientific method to fully appreciate, yet it is a very real factor. (Bell-Cornell)
W75-08205

USER--ORIENTED RESEARCH DESIGNS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6A.
W75-08206

WATERSHED MANAGEMENT WITHOUT SURFACE RUNOFF,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W75-08207

WATER RESOURCE MANAGEMENT-PLANNING FOR ACTION,
Stanley Consultants, Inc., Muscatine, Iowa.
R. G. Paulette, and W. R. Klatt.
Water Resources Bulletin, Vol 10, No 2, p 384-388, April 1974.

Descriptors: *Water resources, *Management, *Planning, *Decision making, River basin development, Methodology, Institutional constraints, Organizations, Inter-agency cooperation.

Effective decision making in water resource management programs necessitates effective planning, planning which encourages that programs get off the shelf and are acted upon. There is a gap between intentions for and results from the planning process. Failures should be examined and the causes identified. A primary cause is neglecting to identify the potentials of the implementing agencies early in the planning process. These agencies constitute a hierarchy of governmental units at national, state, regional and local levels. Each of these levels has its own interests, point of view, capabilities and constraints. A technically and functionally sound plan can fail as a program if these conflicting interests are not accounted for. The implementation mechanisms must be identified as an initial phase of the planning process. All levels of the governmental hierarchy must be involved throughout the planning process. The successful plan must also provide for suitable assignment of responsibilities which are accepted by the executing agency and monitored for satisfactory fulfillment; consistency and continuity of the advocate agency are further essential elements to plan success. Experience in water resource management planning has shown that these strategies will produce programs which are accepted and implemented and which accomplish the goals and objectives of the planning process. (Bell-Cornell)
W75-08209

WATER AND THE ENERGY CRISIS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
W. Viessman, Jr., and K. E. Stork.
Water Resources Bulletin, Vol 10, No 2, p 220-228, April 1974. 6 ref.

Descriptors: *Water resources, *Energy, *Planning, *Water utilization, *Decision making, Management, Social aspects, Political aspects, Economics, Conservation, Technology, Priorities, Environmental effects, Research, Water quality, Agriculture, Irrigation.
Identifiers: *Water use efficiency, Water-energy impacts, Energy crisis.

Water and energy are inextricably bound. Energy is consumed and sometimes produced by every form of water resources system. Opportunities for future development and production of energy resources abound as well as those for significant reductions in energy consumption through wise water development and management. Technological, political, social, economic and environmental factors interrelate in the energy-water mix. The role of the water resources planner will have to be expanded to include assessment of water-energy impacts in addition to traditional planning considerations. An energy conservation account may well have to be added to the dimensions of national economic development and environmental quality in water resources planning. Ways must be found to reduce amounts and rates of water used and energy consumed through new manufacturing processes, improved irrigation practices, better management, new or altered social-political-economic arrangements, and other procedures. To do this will require setting priorities and making difficult management decisions. The water fraternity can play a major role in alleviating the energy crisis. (Bell-Cornell)
W75-08210

THE IMPORTANCE OF PERCEPTIONS IN THE DETERMINATION OF INDIAN WATER RIGHTS,
Washington State Univ., Pullman. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W75-08212

ECOLOGICAL AND ECONOMIC PRINCIPLES IN PARK PLANNING: THE ASSATEAGUE NATIONAL SEASHORE MODEL,
National Park Service, Washington, D.C.
P. Gaskin, and J. R. Stottlemyer.
Coastal Zone Management Journal, Vol 1, No 4, p 395-413, 1974. 5 fig.

Descriptors: *National parks, *Planning, *Economics, *Ecology, *Seashores, *Barrier islands, Management, Recreation, Preservation, Environmental effects, Economic impact, Construction costs, Land management, Beaches, Water utilization, Water quality, Storms, Damages, Erosion, Vegetation, Decision making, Maryland, Virginia.
Identifiers: Maintenance costs, Animal life, Visitor use, *Assateague National Seashore(Md-Va).

The National Park Service is required by law to conserve nationally significant resources for public benefit. Susceptibility to local short-term economic pressures and a lack of understanding of resource dynamics can jeopardize mandate compliance. Assateague National Seashore is an example of a dynamic barrier island where early understanding of ecologic factors should have preceded its establishment and must precede its management and development. Research conducted on a similar system has demonstrated the dramatic environmental impacts and high maintenance costs associated with an inappropriate recreation management scheme. Alternatives are available which minimize resource degradation and maintenance costs without restricting visitation. To better ensure incorporation of long-run ecologic and economic criteria into the decision-making process, a proposal is made which recognizes the need for an expanded research effort and close adherence to early planning steps. Required is the identification of a minimally acceptable basic data package for decision making and the determination of who is responsible for its preparation. (Bell-Cornell)
W75-08216

INTERACTIVE SIMULATION FOR WATER SYSTEM DYNAMICS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-08219

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

LAND USE FORMS AND THE ENVIRONMENT - AN EXECUTIVE SUMMARY,
Chicago Univ., Ill. Dept. of Geography; and Chicago Univ., Ill. Center for Urban Studies.
For primary bibliographic entry see Field 6G.
W75-07971

MODEL DEVELOPMENT AND SYSTEMS ANALYSIS OF THE YAKIMA RIVER BASIN: IRRIGATED AGRICULTURE WATER USE,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W75-07994

THE IMPACT OF HIGH INTEREST RATES ON OPTIMUM MULTIPLE OBJECTIVE DESIGN OF SURFACE RUNOFF URBAN DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W75-08001

ENVIRONMENTAL PROTECTION AGENCY'S 1974 NEEDS SURVEY.
For primary bibliographic entry see Field 5D.
W75-08065

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

COST SHARING AS AN INCENTIVE TO ATTAIN THE OBJECTIVE OF SHORELINE PROTECTION,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
H. E. Marshall.
Prepared for The Center for Economic Studies, Institute for Water Resources, US Army Corps of Engineers, Ft. Belvoir, Virginia. Final report NBSIR 73-294, December, 1973. 63 p, 4 fig, 14 tab, 3 append, 49 ref.

Descriptors: *Cost sharing, *Project planning, Federal government, Shores, *Shore protection, *Economic efficiency, *Administrative costs, *Flood protection, *Water management(Applied), Local governments, Coastal structures, Beach erosion.
Identifiers: Percentage cost-sharing rule, Association Rule, Beach erosion control.

Cost sharing for shoreline protection between federal and nonfederal interests has caused many problems and has proven unsuccessful in encouraging local groups to participate in projects with the federal government. An evaluation is made of existing and alternative cost-sharing rules for shoreline protection with respect to efficiency, equity and administrative feasibility. Existing cost-sharing rules are applicable to shoreline protection programs of flood protection, coastal storm protection and beach erosion. Present rules tend to encourage more costly techniques of production rather than effective management. Two alternative sets of cost-sharing rules are compared: those being proposed in legislation which encourage local interests to seek more and larger projects that are nationally inefficient and those rules recommended here where costs of shoreline protection will be more closely associated with the beneficiaries. The Association Rule would require local beneficiaries to share in all costs of a project purpose in the proportion that local benefits bear to national benefits at the margin. Also, all techniques, management and engineering, should be subject to the same percentage cost-sharing rule. Federal cost sharing should be used as an incentive to encourage nonfederal interests to comply with certain minimum land use requirements that would provide shoreline protection benefits. (Salzman-North Carolina)
W75-08185

ANALYSIS OF COST-SHARING PROGRAMS FOR POLLUTION ABATEMENT OF MUNICIPAL WASTEWATER,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 5D.
W75-08186

WATER QUALITY MANAGEMENT PLAN (APPENDIX E - VOLUME 3), WASTEWATER COLLECTION AND TREATMENT RECOMMENDATIONS FOR BOONE AND HAMILTON COUNTIES,
Department of Metropolitan Development, Indianapolis, Ind. Div. of Planning and Zoning.
For primary bibliographic entry see Field 5D.
W75-08188

MONETARY VALUES OF LIFE AND HEALTH,
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 4A.
W75-08202

A NOTE ON COST-EFFECTIVENESS IN DATA ACQUISITION IN WATER QUALITY MANAGEMENT,
Vandkvalitetsinstitut, Soborg (Denmark).
For primary bibliographic entry see Field 5G.
W75-08214

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
S. L. Feldman.
Water Resources Research, Vol 11, No 2, p 355-356, April 1975. 10 ref.

Descriptors: *Peak loads, *Pricing, *Water supply, Operating costs, Design, Equity, Seasonal, Sprinkling, Systems analysis, Mathematical models, Demand, Peak loads.
Identifiers: *Urban water systems, Design capacity, Meters.

Peak-load pricing through seasonal price increases without changes in metering and billing practices may produce distortions in efficiency and equity in urban water systems. Demand management models using parameters to evaluate the effect of seasonal price policy upon maximum day sprinkling demands may be misleading because of behavioral constraints to price responsiveness. Proposed are alternative pricing schemes that are likely candidates for improving the operating cost structure and design capacity of water supply systems without violating popular notions of equity. (Bell-Cornell)
W75-08215

6D. Water Demand

FLORIDA'S WATER RESOURCES,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 4A.
W75-07872

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

WRINGING OUT THE WEST, REMEMBER THE MISSOURI AND THE COLORADO,
J. McCaull.
Environment, Vol 16, No 7, p 10-17, September 1974. 1 tab, 1 fig, 5 photos.

Descriptors: *Salinity, *Colorado River, *Missouri River, *Water demand, *Industrial water, Water allocation(Policy), Water requirements, Water shortage, Water utilization, Irrigation, River basins, Great Plains, Rocky Mountain Region.
Identifiers: Energy development.

Federal studies reveal that future energy development projects in the western states will require more water than is available. The Missouri and Colorado Rivers are in greatest jeopardy from this development. The industrial plans could reduce the flow of the lower Missouri to a rate that will barely float a barge, and the lower Colorado River may become too small and too salty to support irrigation demands in California and the Southwest. With little or no public awareness, water used since 1972 have been directed toward energy conversion and development projects instead of irrigation, wildlife management, or municipal and industrial purposes. As a result, the development of the entire energy industry must be evaluated in assessing future water requirements in the West. (Mastic-Arizona)
W75-08101

ON THE PEAK-LOAD PRICING OF URBAN WATER SUPPLY,
Clark Univ., Worcester, Mass. Graduate School of Geography.
For primary bibliographic entry see Field 6C.
W75-08215

6E. Water Law and Institutions

URBAN SEDIMENT PROBLEMS: A STATEMENT ON SCOPE, RESEARCH, LEGISLATION, AND EDUCATION.
American Society of Civil Engineers, New York. Task Committee on Urban Sedimentation Problems.
For primary bibliographic entry see Field 5G.
W75-07931

ECONOMIC AND INSTITUTIONAL ANALYSIS OF COLORADO WATER QUALITY MANAGEMENT,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W75-07992

RIVER BASIN WATER PLANNING ORGANIZATIONS IN THE 60'S,
Utah State Univ., Logan. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W75-08011

INSTITUTIONAL CONSTRAINTS ON AGRICULTURAL WATER USE,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
R. C. Ward, G. V. Skogerboe, and W. R. Walker.
Presented at Winter Meetings of the American Society of Agricultural Engineers, December 11-14, 1973. Chicago, Illinois. 18 p, 18 ref. (ASAE Paper No 73-2545). OWRR B-071-COLO(7).

Descriptors: *Water utilization, *Agriculture, *Institutional constraints, Law enforcement, Water allocation(Policy), Colorado, River basins.

Scarcity of water in the western U.S. has resulted in the development of a vast institutional framework to insure its just allocation. The institutions are briefly reviewed, and their impact on agriculture's water use is discussed. (Skogerboe-Colorado State)
W75-08013

ENVIRONMENTAL PROTECTION AGENCY'S 1974 NEEDS SURVEY.
For primary bibliographic entry see Field 5D.
W75-08065

DUDLEY SPECIAL ROAD DISTRICT OF STODDARD COUNTY V. HARRISON (ACTION BY UPSTREAM LANDOWNERS FOR REMOVAL OF LEVEE CONSTRUCTED BY DOWNSTREAM OWNERS NEAR UPSTREAM BORDER OF PROPERTY).
517 S.W.2d 170-182 (Mo. Ct. App. 1974).

Descriptors: *Levees, *Judicial decisions, *Natural flow doctrine, *Natural streams, *Obstruction to flow, Land tenure, *Missouri, Check structures, Retaining walls, Flood control, Legal aspects, Public rights, Riparian land, Water law, Water rights, Riparian rights, Streams, Floods, Alteration of flow, Diversion.
Identifiers: Injunctive relief, Nuisance(Legal aspects), Absolute liability.

Upstream landowners brought an action against downstream landowners seeking removal of a levee constructed by downstream landowners near

the upstream border of their property. Running through the lands of the plaintiffs was a natural watercourse, which also flowed through the land of the defendants prior to construction of the levee. Plaintiffs contended that the levee 'blocked the natural flow of water' causing it to collect north of the levee, and inundate the plaintiffs' lands. Defendants conceded the effect of changing the course of the water but argued that it did not reduce the drainage benefits which plaintiffs had derived. The court held it unlawful for a downstream landowner to obstruct a natural watercourse in a manner causing waters to overflow and inflict damage to the land of upstream landowners, whether or not the conduct was intentional or negligent. In granting injunctive relief, the court further held that the defendants must restore the natural course of the water, or make alternative provision to discontinue flooding of plaintiffs' lands. (Fernandez-Florida)
W75-08066

KURRLE V. WALKER (ACTION BY LANDOWNERS TO ENJOIN BARRIER FENCE AND COMMERCIAL MARINA CONSTRUCTED BY OTHER LANDOWNER INTO BAYOU).
224 N.W.2d 99-103 (Ct. App. Mich. 1974).

Descriptors: *Bayous, *Barriers, *Marinas, *Navigable waters, *Riparian rights, *Michigan, Ponds, Bodies of water, Structures, Sea walls, Judicial decisions, Water law, Navigation, Legal aspects, Trespass, Water rights, Obstruction to flow.
Identifiers: Injunctive relief, Nuisance(Legal aspects).

Plaintiff landowners sued for damages and injunction relief for removal of a barrier fence and commercial marina constructed in a bayou by defendant, adjacent landowner. The respective properties are bordered on one side by a navigable pond. Defendant began construction of a marina on his property and erected a wall which effectively precluded plaintiffs from access to and use of the pond. The main issue was whether the defendant's construction of docks and piers on the navigable inlet was such an interference with plaintiffs' riparian rights that an injunction should issue ordering removal of the structures from the water. In upholding the equitable power of a court to enjoin a nuisance, where legal remedies are inadequate, the court ordered the removal of the barrier fence, which would be sufficient to restore to plaintiffs their access to the bayou for navigational purposes. Balancing the equities, the court further held that the remedy for maintenance of the marina should be damages. (Fernandez-Florida)
W75-08067

STATE V. DEETZ (ACTION BY STATE AGAINST DEVELOPER TO ENJOIN DEPOSIT OF MATERIALS IN LAKE WISCONSIN).
224 N.W.2d 407-419 (Wis. 1974).

Descriptors: *Judicial decisions, *Deposition(Sediments), *Lakes, *Surface runoff, *Soil erosion, *Wisconsin, Water law, Legal aspects, Silting, Runoff, Erosion, Bank erosion, Adjacent landowners, Public rights, Riparian land, Water rights, Riparian rights.
Identifiers: Common enemy rule, Nuisance(Legal aspects), Injunctive relief, Public trust doctrine, Standing(Legal), Reasonable use doctrine.

The State of Wisconsin brought an action against a property developer and others seeking to enjoin them from permitting the deposit of materials in Lake Wisconsin. Defendants purchased a large area of land on a bluff overlooking the lake and platted and developed a residential area. This development disturbed the topsoil causing erosion and runoff resulting in the formation of substantial sand deltas which impaired fishing, boating, and swimming. Plaintiff contended that under the 'public trust' doctrine any interference with the public's right to use the State's navigable waters is a nuisance and must be abated. Defendants argued that the 'common enemy doctrine' is applicable, whereby a possessor of land has an unlimited right to deal with the surface water on his land. Plaintiff responded that the common enemy rule should be overruled in view of the 'reasonable use' doctrine which imposes liability for unreasonable interference with the flow of surface waters. The court abandoned the common enemy doctrine with respect to surface waters and prospectively adopted the reasonable use doctrine, holding that the public trust doctrine merely gives the State standing as trustee to vindicate any rights that are infringed by existing law. (Fernandez-Florida)
W75-08068

COMMONWEALTH, DEPARTMENT OF ENVIRONMENTAL RESOURCES V. BOROUGH OF CARLISLE (APPEAL FROM ORDER PROHIBITING DISCHARGES INTO SANITARY SEWER SYSTEM WITHOUT DER APPROVAL).
For primary bibliographic entry see Field 5G.
W75-08069

SHELL OIL CO. V. POLLUTION CONTROL BOARD (PETITION BY OIL CO. TO REVIEW DENIAL OF VARIANCE FOR DISCHARGE OF WASTE WATER CONTAINING CYANIDE).
For primary bibliographic entry see Field 5G.
W75-08070

VILLAGE OF GLENCOE V. METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO (ACTION TO REVIEW DISTRICT'S WASTE CONTROL ORDINANCE WHICH PROHIBITED ANY DISCHARGE OF SEWAGE, INDUSTRIAL OR OTHER WASTE INTO LAKE MICHIGAN).
320 N.E.2d 524-529 (App. Ct Ill 1974).

Descriptors: *Sewage, *Sewage disposal, *Waste disposal, Waste treatment, Wastes, Industrial wastes, *Illinois, Sewage treatment, Sewerage, Sewers, Lake Michigan, Pollution abatement, Pollutants, Water pollution, Water, Water pollution control, Water pollution treatment, Water supply, Lakes.
Identifiers: Hazardous substances(Pollution).

The Village of Glencoe, Illinois, brought an action for review of an order of the board of trustees of the Metropolitan Sanitary District of Greater Chicago requiring the Village to cease and desist from violating the District's sewage and waste control ordinance. The Circuit Court for Cook County affirmed the order and the Village appealed. The first District, Fourth Division, Appelate Court held that the District's enactment of an ordinance providing that 'no sewage, industrial wastes or other waste of any kind may be discharged into the waters of Lake Michigan' did not exceed the District's statutory authority. The court reasoned that such ordinances did not bar a discharge without regard to whether it constituted pollution, and that the ordinance bore a rational relation to the legitimate public interest of preventing pollution of water supplies. Even if the Village's discharge into Lake Michigan of alum and particles previously filtered out of raw lake water was not an 'industrial waste' within the meaning of the statute, such discharge was an 'other waste' within the statutory provision granting the District the power to prevent 'other wastes'. (Gagliardi-Florida)
W75-08071

SOME EFFECTS OF EXTENDING THE NAVIGATIONAL SEASON ON THE GREAT LAKES: A NEED FOR CONGRESSIONAL ACTION,
Cleveland State Univ., Ohio. Coll. of Law.
W. C. Hain.
Cleveland State Law Review, Vol 23, p 295-318 (1974). 24 p, 131 ref.

Descriptors: *Ice cover, *Great Lakes, *Navigation, *Rivers and Harbors Act, Iced lakes, Lake ice, Lakes, Ice, Federal government, Lake Superior, Lake Huron, Rivers, Navigable rivers, Water law, Water rights, Legal aspects, Legislation, Economics, Islands, Transportation.
Identifiers: *Navigational servitude, Water rights(Non-riparians).

The private right in the traditional use of ice in its natural condition is contrasted with the economic desirability of opening a vast, commercially rich region to year-round waterborne accessibility. Inhabitants of a group of islands located in the St. Mary's River, which links Lake Superior and Huron are threatened with the loss of accessibility to the mainland as a result of a project which will extend the navigation season on the Great Lakes by premature and unnatural breakup of the surrounding ice cover used by the islanders for transit to and from the mainland. The problem stems from the compelling economic need for increased utilization of the Great Lakes Region. Traditionally, the right of travel on ice has been recognized as a public right. However, this right is inferior to the interests of navigation. Thus, the federal government has the power to improve navigation even though the island inhabitants may be stranded. A solution suggested is that the federal government consider the human factors and authorize the expenditure of federal resources to promote public transportation interests. (Fernandez-Florida)
W75-08072

THE ENVIRONMENTAL PROTECTION AGENCY AND COASTAL ZONE MANAGEMENT: STRIKING A FEDERAL-STATE BALANCE OF POWER IN LAND USE MANAGEMENT,
For primary bibliographic entry see Field 5G.
W75-08073

PEAK LOAD PRICING AND URBAN WATER MANAGEMENT: VICTORIA, B.C., A CASE STUDY,
Victoria Univ. (British Columbia). Dept. of Economics.
For primary bibliographic entry see Field 3B.
W75-08074

EPA AUTHORITY AFFECTING LAND USE,
Ross, Hardies, O'Keefe, Babcock and Parsons, Chicago, Ill.
For primary bibliographic entry see Field 5G.
W75-08172

COST SHARING AS AN INCENTIVE TO ATTAIN THE OBJECTIVE OF SHORELINE PROTECTION,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 6C.
W75-08185

THE AMERICAN INDIAN AND MISSOURI RIVER WATER DEVELOPMENTS,
Nevada Univ., Reno. Renewable Resources Center.
For primary bibliographic entry see Field 6B.
W75-08204

WATER RESOURCE MANAGEMENT-PLANNING FOR ACTION,
Stanley Consultants, Inc., Muscatine, Iowa.
For primary bibliographic entry see Field 6B.
W75-08209

THE IMPORTANCE OF PERCEPTIONS IN THE DETERMINATION OF INDIAN WATER RIGHTS,
Washington State Univ., Pullman. Dept. of Political Science.

M. P. Berry.
Water Resources Bulletin, Vol 10, No 1, p 137-143, February 1974. 9 ref.

Descriptors: *Water resources, *Planning, *Social aspects, *Legal aspects, *Water rights, Water allocation(Policy), Decision making, Federal government, State jurisdiction, Costs.
Identifiers: *American Indians.

The American Indian occupies a unique place in the federal system of government. There are indications that this relationship will continue and that Indian reservations are at the threshold of economic development. As this occurs, the nature and extent of Indian water rights becomes more important to Indian and non-Indian alike. The determination of these rights is a matter of more than judicial decisions. To a large degree the determination of these rights will rest in the non-judicial arena and will be influenced by the perceptions of those rights held by Indians and water allocation officials, both state and federal. If the perceptions of these political actors are not congruent, then political conflict will occur as the rights become more important. To depend solely upon the judicial system to resolve these conflicts entails risks and costs to both Indians and to allocating officials. Indians are taking seriously the federal policy of Indian self-determination, and water allocation officials run decided risks in failure to realize this. An alternative suggested is to include Indians as consulting parties when decisions are being made that affect Indian interests. (Bell-Cornell)
W75-08212

THOSE ELUSIVE 1985 WATER QUALITY GOALS.
For primary bibliographic entry see Field 5G.
W75-08233

6F. Nonstructural Alternatives

FLOOD PLAIN MANAGEMENT AND IMPLEMENTATION STRATEGIES FOR FPM PROGRAMS,
Iowa State Water Resources Research Inst., Ames.
M. D. Dougal, R. L. Rossmiller, and T. A. Austin.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 947, $5.25 in paper copy, $2.25 in microfiche. Regional Workship on Research Needs, Proceedings, Report ISWRRI-67, December 1974, 105 p. OWRT X-135(no. 9071)(2) 14-31-0001-9079.

Descriptors: *Flood plains, *Management, *Flood plain zoning, *Nonstructural alternatives, *Illinois, *Iowa, *Land use, *Research priorities, Social aspects, Economic impact, Technology, Institutional constraints, Programs, Engineering, Floodways, Flood control, Regulations, Legal aspects, Water law, Water policy.
Identifiers: Research needs.

Research needs in the field of flood plain management (FPM), particularly as directed to implementation strategies for FPM programs are identified and discussed. Results are presented of a midwest regional workshop in which representatives of state and Federal agencies working in water resources participated with unversity faculty in evaluating problem areas and the need for additional knowledge. A multidisciplinary approach was used to concentrate on four broad areas: (1) Land use and policy phase, (2) technical and related engineering phase; (3) the social-economic relationships and associated problem areas; (4) the legal and institutional areas and remaining obstacles to acceptance and implementation of FPM programs. A summary and priority assignment is presented for the major problem areas and identified research needs. Included are key comments from participants and comprehensive rules, procedures, and regulations as proposed for two midwestern states, Iowa and Illinois.
W75-07890

STATE-OF-THE-ART OF ESTIMATING FLOOD DAMAGE IN URBAN AREAS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W75-07939

FLOOD PROTECTION BENEFITS AS REFLECTED IN PROPERTY VALUE CHANGES,
Kentucky Univ., Lexington. Dept. of Economics.
D. M. Soule, and C. M. Vaughan.
Water Resources Bulletin, Vol 9, No 5, p 918-922, October 1973. 2 tab, 4 ref. OWRT A-006-KY(14).

Descriptors: *Flood protection, *Benefits, *Economic impact, *Property values, *Measurement, Flood damage, Annual, Land use, Real property, Methodology, Lakes, Reservoirs, Dams, Rates, Prices, Statistical models, Systems analysis, *Kentucky.
Identifiers: *Covariance analysis, *Lake Cumberland(Ky), Depressed land value, Shoreline, Regression coefficients.

Measuring flood control benefits from estimated property damage in prior floods omits losses in the form of depressed values of land put to less valuable uses because of annual flooding. Herein, economic benefits from flood protection are measured by differences in property value changes in a period following introduction of flood protection. A statistical analysis of covariance compares differences in rates of change in average selling price per urban sale of real property over a 15-year period among three urban areas differently situated around Lake Cumberland, Kentucky. The three regions considered were: an area below a dam, which receives flood control benefits; a region above the dam, including areas inundated by the lake; and a contiguous region not directly affected by the reservoir. The analysis shows a much larger rate of increase in real property value for the area receiving flood protection. This suggests that the economic benefits from a flood protection facility include these additional property value increases as well as the prevented property value increases as well as the prevented peoperty damage. Moreover, the greater rate of increase in value of property in the region protected from flooding may be regarded as flood control benefits that would not be indicated by a study merely of property damage in prior floods. (Bell-Cornell)
W75-08004

FOURMILE RUN LOCAL FLOODPLAIN PROTECTION, CITY OF ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-08025

PROPOSED CHASSAHOWITZKA WILDERNESS AREA, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 6G.
W75-08034

INITIAL COASTLINE PLAN FOR THE SAN DIEGO REGION,
Duncan and Jones, Berkeley, Calif. and San Diego County Comprehensive Planning Organization, Calif.
April, 1974. 85 p, 4 maps, 5 append.

Descriptors: *Comprehensive planning, Coasts, *Planning, Shores, *Shore protection, *California, Beaches, *Beach erosion, Environment, *Lagoons, Bays, Estuaries.
Identifiers: *San Diego(Calif), *Coastal planning, San Diego County(Calif), Coastal zone, Camp Pendleton(Calif), Lagoon buffers.

Basic goals, objectives and policies primarily directed at preserving the coast for public use with emphasis on conservation as opposed to development are set forth. Integration of the natural and urban environment and preservation and enhancement of distinct, identifiable communities throughout the region are goals for the physical form of the region. Other goals are: (1) development of open space, needed to preserve natural resources and to provide land for agriculture, parks, and outdoor recreation; (2) retention of natural benefits of flood plains and estuaries; (3) beneficial utilization and conservation of soil; (4) elimination of billboards; and (5) adoption of a land ethic for a balanced coexistence of man and nature. For coastal areas of regional significance, ocean beach, shoreline lagoons, and lagoon buffers, establishment of a special regional review procedure including a cost/benefit evaluation and environmental impact analysis of any proposed development project is recommended. Beach and lagoon resource management concerned with erosion and stabilization of lagoon openings and ocean estuaries should investigate technology and methods of control in cooperation with state, federal and regional agencies. Financing proposals stress regional/local funding (2:1), and promote general obligation bonds for facility construction and land acquisition. Specific recommendations for local coastal jurisdictions, while emphasizing coastal natural resources, do not give reduced priority to industrial, commercial or recreational uses. Cities and unincorporated coastal areas are described and policies are recommended for each area. (Park-North Carolina)
W75-08171

FLOOD PLAIN INFORMATION: CROW CREEK, CHEYENNE, WYOMING,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-08174

FLOOD PLAIN INFORMATION: SAN DIEGO CREEK AND PETERS CANYON WASH, ORANGE COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08175

FLOOD PLAIN INFORMATION: MARAIS DES CYGNES RIVER, MELVERN TO OTTOWA, KANSAS, VOLUME 1.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-08176

FLOOD PLAIN INFORMATION: SALT CREEK, RIVERSIDE COUNTY, CALIFORNIA.
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08177

FLOOD PLAIN INFORMATION: WILSON AND WILDWOOD CREEKS, SAN BERNADINO COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08178

FLOOD PLAIN INFORMATION, ALLEGHENY RIVER, CLARION COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W75-08179

FLOOD PLAIN INFORMATION: BEAVERDAM CREEK, HANOVER COUNTY, VIRGINIA,
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-08180

FLOOD PLAIN INFORMATION: RAPID CREEK, RAPID CITY, SOUTH DAKOTA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-08183

FLOOD PLAIN INFORMATION: VIRGIN RIVER AND FORT PIERCE WASH, VICINITY OF ST. GEORGE, WASHINGTON COUNTY, UTAH,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08184

AN APPLICATION OF DISCRIMINANT ANALYSIS TO PREDICT INDUSTRIAL/COMMERCIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis.
C. F. Meyer, and A. B. Corbeau.
Water Resources Bulletin, Vol 10, No 3, p 426-439, June 1974. 2 fig, 10 tab, 24 ref.

Descriptors: *Flood plains, *Data collections, *Statistical methods, Locating, Industries, Surveys, Costs, Computers, Research, Missouri.
Identifiers: *Discriminant analysis, Factor analysis, Commercial firms, Manufacturing, Prediction, St. Louis(Missouri), Data management, Software.

Described are the techniques of factor and discriminant analyses to isolate and quantify the statistical differences between firms located on flood plains and those located off flood plains. The research effort described consists of three segments: data collection, isolation of potential classification variables, and the determination of the appropriate discriminant functions to classify a given firm as either on or off the flood plain. Significant classification functions are developed for both manufacturing and commercial establishments, whose arguments include dollar sales volume, total shipping cost, total employee cost, dollar valuations on the building and inventories, all on an annual basis, and the square footage of the site. (Bell-Cornell)
W75-08208

6G. Ecologic Impact Of Water Development

LAND USE FORMS AND THE ENVIRONMENT - AN EXECUTIVE SUMMARY,
Chicago Univ., Ill. Dept. of Geography; and Chicago Univ., Ill. Center for Urban Studies.
B. J. L. Berry.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 093, $3.75 paper copy, $2.25 microfiche. Environmental Protection Agency, Report EPA-600/5-75-003, March 1975. 36 p, 4 fig, 2 tab. EPA Program Element 1HA098. 801419.

Descriptors: *Land use, *Environmental effects, Spatial distribution, Pollutants, Cities, Regional analysis, Water quality, Comparative, Comparative benefits, Human population.

This executive summary contains highlights of the full study which focused on the relationship between land use forms and environmental quality. It investigated the influence of the spatial distribution of land rises on the pollutants generated and the resulting environmental quality. The investigation was assisted by the preparation of a 'sorting table' in which the 'rows' are the various urban forms and land use patterns and the 'columns' are the several classes, types and elements of environmental pollution. A comparative analysis of the materials assembled for the table determined trends across the urban forms and land use types, focusing particularly on the identification of those land use forms that naturally generate the least pollution. Also, parallel investigation of national trends in population distribution and land use was performed, so that some expectations could be developed as to the likely impacts on pollution of current patterns of regional growth and change. (EPA)
W75-07971

SIXES BRIDGE DAM AND LAKE, MARYLAND AND PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8F.
W75-08015

UPPER THOMPSON SANITATION DISTRICT, PROJECT NO. C 080322 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W75-08016

MAINTENANCE OF BUTTERMILK CHANNEL, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 8A.
W75-08017

PROPOSED 1973 OUTER CONTINENTAL SHELF OIL AND GAS GENERAL LEASE SALE, OFFSHORE MISSISSIPPI, ALABAMA AND FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Land Management, Washington, D.C.
For primary bibliographic entry see Field 5G.
W75-08018

BLUE MARSH LAKE PROJECT, TULPEHOCKEN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
For primary bibliographic entry see Field 8D.
W75-08019

CORBELL HULL DAM AND RESERVOIR, CUMBERLAND RIVER, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.
For primary bibliographic entry see Field 8A.
W75-08020

GUADALUPE RIVER, TEXAS (REMOVAL OF LOG JAMS) (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Galveston, Tex.
For primary bibliographic entry see Field 4A.
W75-08021

PALATLAKAHA RIVER WATERSHED, LAKE COUNTY, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Gainesville, Fla.
For primary bibliographic entry see Field 8A.
W75-08022

APPLICATION FOR PERMIT TO CONSTRUCT A DAM ON MURDERERS CREEK GREEN COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 8D.
W75-08023

SHOAL CREEK CHANNEL, CHARITON-LITTLE CHARITON BASINS, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kanasa City, Mo.
For primary bibliographic entry see Field 4A.
W75-08024

FOURMILE RUN LOCAL FLOODPLAIN PROTECTION, CITY OF ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-08025

HAMPTON CREEK NAVIGATION PROJECT (MAINTENANCE DREDGING) HAMPTON, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-08026

CENTRAL AND SOUTHERN FLORIDA PROJECT, LAKE OKEECHOBEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W75-08027

LAKEVIEW LAKE, MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Forth Worth, Tex.
For primary bibliographic entry see Field 8A.
W75-08028

SOUTH FORK WATERSHED, PAWNEE AND RICHARDSON COUNTIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 8A.
W75-08029

TROUT RUN EARTHFILL DAM, BOROUGH OF BOYERTOWN, BERKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Delaware River Basin Commission, Trenton, N.J.
For primary bibliographic entry see Field 8F.
W75-08030

NAWILIWILI SMALL BOAT HARBOR, KAUAI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii.
For primary bibliographic entry see Field 8A.
W75-08031

SOUTH DADE COUNTY FLORIDA, C120377 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W75-08032

ARKANSAS RIVER AND TRIBUTARIES ABOVE JOHN MARTIN DAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N.Mex.
For primary bibliographic entry see Field 8A.
W75-08033

PROPOSED CHASSAHOWITZKA WILDERNESS AREA, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washington, D.C.

Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-Fl-73-1370-F, $9.50 in paper copy, $2.25 in microfiche. August 17, 1973. 76 p, 2 map, 10 tab.

Descriptors: *Wildlife management, *Wildlife conservation, *National wildlife refuges, Environmental effects, Wildlife, Wildlife habitats, *Florida, Environment, Environmental control.
Identifiers: *Environmental impact statements, *Citrus County(Fla), Hernando County(Fla), *Chassahowitzka National Wildlife Refuge(Fla).

The proposal recommends that 16,900 acres of the Chassohowitzka National Wildlife Refuge located in Citrus and Hernando Counties, Florida, be designated as wilderness within the National Wilderness Preservation System. No immediate or long-range environmental change would occur in the area as a result of the proposed action. The proposal will give additional recognition and protection to a significant area of wilderness environment. The most significant adverse environmental impact will be the possible prohibition of development of the Intracoastal Waterway through the proposed wilderness area. The alternatives that were considered were to leave the area under the existing management of the Chassahowitzka National Wildlife Refuge and to modify the size of the proposal. (Gagliardi-Florida)
W75-08034

SPRING BROOK WATERSHED, LANGLADE AND MARATHON COUNTIES, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-08035

NORTH DADE COUNTY REGIONAL COLLECTION, TREATMENT AND DISPOSAL SYSTEM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Atlanta, Ga. Region IV.
For primary bibliographic entry see Field 5D.
W75-08036

MAINTENANCE DREDGING, BRONX RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, New York.
For primary bibliographic entry see Field 8A.
W75-08037

PROPOSED HABITAT ENHANCEMENT PROJECT TOPCOCK MARSH UNIT, HAVASU NATIONAL WILDLIFE REFUGE, ETC. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 8D.
W75-08038

BIG RUNNING WATER DITCH WATERSHED PROJECT, LAWRENCE AND RANDOLPH COUNTIES, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Little Rock, Ark.
For primary bibliographic entry see Field 4D.
W75-08039

HANNIBAL LOCKS AND DAM, OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 8A.
W75-08040

MARKLAND LOCKS AND DAM HIGHWAY BRIDGE AND APPROACHES, KENTUCKY AND INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W75-08041

CONSTRUCTION OF WASTEWATER FACILITIES, FORT WORTH, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Office of Grants Coordination.
For primary bibliographic entry see Field 5D.
W75-08042

CHANNEL EXTENSION, SIUSLAW RIVER AND BAR, LAND COUNTY, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
For primary bibliographic entry see Field 8A.
W75-08043

NAVIGATION SEASON EXTENSION DEMONSTRATION PROGRAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W75-08044

RED RIVER WATERWAY, LOUISIANA, TEXAS ARKANSAS, AND OKLAHOMA, AND RELATED PROJECTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 8A.
W75-08045

NEW ROCHELLE AND ECHO BAY HARBORS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
For primary bibliographic entry see Field 8A.
W75-08046

UPPER THOMPSON SANITATION DISTRICT, ESTES PARK, COLORADO PROJECT NO. C0803222 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W75-08047

DIKED DISPOSAL AREA, HURON HARBOR, ERIE COUNTY, HURON, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, NY.
For primary bibliographic entry see Field 5G.
W75-08048

RICHMOND INNER HARBOR, MAINTENANCE DREDGING, CONTRA COSTA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W75-08049

AUTHORIZED GRANITE REEF AQUEDUCT, CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8A.
W75-08050

PERILLA MOUNTAIN WATERSHED PROJECT, COCHISE COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W75-08051

KAIMU BEACH HAWAII, PROPOSED SHORE PROTECTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
For primary bibliographic entry see Field 8A.
W75-08052

VIRGINIA KEY BEACH EROSION CONTROL PROJECT, SECOND PERIODIC NOURISHMENT AND GROINS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 8A.
W75-08053

LAKE QUINAULT SEWAGE COLLECTION AND TREATMENT FACILITY, OLYMPIC NATIONAL FOREST, OLYMPIA, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 5D.
W75-08054

HIGHWAY 112 CRITICAL EROSION CONTROL RESOURCES CONSERVATION AND DEVELOPMENT PROJECT MEASURE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Madison, Wis.
For primary bibliographic entry see Field 8A.
W75-08055

VERONA DAM AND LAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 8F.
W75-08056

CHANNEL TO NEWPORT NEWS, VIRGINIA (MAINTENANCE DREDGING) (ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 8A.
W75-08057

INDIAN CREEK WATERSHED PROJECT, CITY OF CHESAPEAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Richmond, Va.
For primary bibliographic entry see Field 8A.
W75-08058

HUNGRY HORSE CLOUD SEEDING PROJECT (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bonneville Power Administration, Portland, Oreg.
For primary bibliographic entry see Field 3B.
W75-08059

EAGLE-TUMBLEWEED DRAW WATERSHED, EDDY AND CHAVES COUNTIES, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W75-08060

MISSOURI RIVER GARRISON DAM TO LAKE OAHE RESERVOIR (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 8A.

W75-08061

PAINT CREEK WATERSHED, HARPER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Stillwater, Okla.
For primary bibliographic entry see Field 4D.
W75-08062

THE ENVIRONMENTAL PROTECTION AGENCY AND COASTAL ZONE MANAGEMENT: STRIKING A FEDERAL-STATE BALANCE OF POWER IN LAND USE MANAGEMENT,
For primary bibliographic entry see Field 5G.
W75-08073

ENVIRONMENTAL ANALYSIS OF THE KICKAPOO RIVER IMPOUNDMENT.
Wisconsin Univ., Madison. Inst. for Environmental Studies.
IES Report 28, November 1974. 291 p, 95 fig, 97 tab, 198 ref. DACW 37-C-0130.

Descriptors: *Environmental effects, *Reservoir construction, *Water quality, *Nutrients, Agricultural watersheds, Runoff, Sedimentation, Water release, Algae, Eutrophication, Aquatic plants, Wildlife habitats, Watersheds(Basins), Vegetation, Forests, Grazing, Economics, Stream fishing, Tailwater, Water temperature, Recreation, Land use, Stream improvement, Reservoir operation, Wisconsin.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

A multidisciplinary investigation to determine water quality in the proposed impoundment to be constructed on the Kickapoo River north of La Farge, Wisconsin is described. The La Farge Reservoir is expected to be eutrophic and will support a large growth of macrophytes and algae. An environmental assessment was made of the sources and availability of nitrogen and phosphorus. Downstream temperature will be able to be controlled by selective water withdrawal to maintain cold-water fisheries. Sediments and their distributions were investigated. The present population of fish, invertebrates, birds, mammals, and terrestrial vegetation was determined and predictions made of the probable impact of the impoundment on the algal biomass, fish, invertebrates, birds, mammals, terrestrial vegetation, and macrophytes. Land use and development trends for the area surrounding the Kickapoo River Valley near the proposed impoundment were studied. Estimates were made of the costs for establishing and operating water improvement procedures in the lake. Specific recommendations are made to ensure the best possible water quality: such as encouragement of marsh vegetation, sewage treatment, hypolimnetic aeration, water level control, selective planting and harvesting of macrophytes, control of land use practices, watershed management, construction of sediment trap dams, use of algicides, and fencing. (See W75-08159 thru W75-08169) (Buchanan-Davidson-Wisconsin)
W75-08158

ENVIRONMENTAL ASSESSMENT OF THE SOURCES AND AVAILABILITY OF NITROGEN AND PHOSPHORUS TO LAKE LA FARGE,
Wisconsin Univ., Madison. Dept. of Soil Science.
D. R. Keeney, D. S. Nichols, and K. W. Lee.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 1-44, November 1974. 36 fig, 33 tab, 20 ref. DACW 37-C-0130.

Descriptors: *Reservoirs, *Nitrogen, *Phosphorus, *Water pollution control, *Reservoir operation, Algal control, Aquatic weed control, Sewage disposal, Farm wastes, Costs, Fertilization, Wisconsin, Sewage treatment, Eutrophication, Water pollution sources, Base flow, Rivers, Regression analysis, Soil surveys, Agricultural watersheds.
Identifiers: *Kickapoo River(Wis), La Farge Lake(Wis), Nutrient load.

The nitrogen and phosphorus loadings in the proposed La Farge Impoundment on the Kickapoo River in Wisconsin are predicted to be high. The severity of the water quality problems will depend on the light penetration depth. The river drains on agricultural watershed with moderately fertile soils; thus a large portion of the nutrients will be from non-point sources which are difficult to control. Runoff is the most important source, followed by base points, sewage treatment plants, and farmyards. The river contains sufficient silica dioxide and carbon to support aquatic weed and algal populations. Water quality will be similar to that of other area impoundments. If the impoundment is completed, sound reservoir management should be practiced to control algal blooms and provide weed-free recreational areas. Sewage treatment plants should provide at least secondary treatment and land disposal of effluents and sludge to recycle the nutrients and provide tertiary treatment should be considered. Control of animal wastes from farmyards and elimination of manure spreading on frozen ground should be encouraged. Control measures should be initiated as soon as possible. The reservoir will have significant effects on downstream water, especially if hypolimnion withdrawal is practiced during the summer. Nutrient control costs are estimated. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08159

SELECTIVE WITHDRAWAL FROM THE LA FARGE RESERVOIR FOR DOWNSTREAM TEMPERATURE CONTROL,
Wisconsin Univ., Madison. Water Resources Center.
For primary bibliographic entry see Field 5G.
W75-08160

ENVIRONMENTAL ASSESSMENT OF SEDIMENT SOURCES AND SEDIMENTATION DISTRIBUTIONS FOR THE LAKE LA FARGE WATERHSED AND IMPOUNDMENT,
Wisconsin Univ., Madison. Dept. of Geography.
For primary bibliographic entry see Field 2E.
W75-08161

ALGAL BIOMASS PROJECTIONS FOR THE PROPOSED KICKAPOO RIVER IMPOUNDMENT,
Wisconsin Univ., Madison. IBP Lake Wingra Project.
For primary bibliographic entry see Field 5C.
W75-08162

FISH POPULATION INVESTIGATIONS,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 8I.
W75-08163

IMPACT OF A PROPOSED IMPOUNDMENT OPERATION ON THE INVERTEBRATE ASSEMBLAGES IN THE KICKAPOO RIVER, LA FARGE (VERNON CO.), WISCONSIN,
Wisconsin Univ., Madison. Dept. of Zoology.
For primary bibliographic entry see Field 6B.
W75-08164

BIOLOGICAL ASPECTS--BIRDS AND MAMMALS,
Wisconsin Univ., Madison. Dept. of Wildlife Ecology.
R. L. Jurewicz, and O. J. Rongstad.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impundment, p. 160-189. 5 fig, 14 tab, 32 ref. DACW 37-C-0130.

Descriptors: *Wildlife, *Impoundments, Wisconsin, Hunting, Birds, Mammals, Game birds, Non-game birds, Song birds, Waterfowl, Furbearers, Habitats, Varieties, Deer, Small game, Wildlife management, Reservoirs, Cultivated lands, Forests, Marshes, Water levels.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

The effect of the proposed impoundment at La Farge on the Kickapoo River, Wisconsin, on wildlife of the related watershed is evaluated based on an inventory of bird and mammal species. Management recommendations are made, including hunter use. Vegetation of tall grass fields, short grass forb fields, sedge meadows, low-land hardwood, oak-maple-elm woodlot, and hemlock-birch stands was identified and small mammals trapped. Meadow voles, shrew, and mice, red squirrels, and chipmunks were found. White-tailed deer, cottontail rabbits, gray, red and fox squirrels, otter, beaver, muskrat, mink, raccoon, red and gray fox, skunk, opossum, waterfowl, ruffed grouse, bobwhite quail, pheasants, woodcocks, and songbirds were counted. The impoundment should prove beneficial to the wildlife. White-tailed deer could pose a problem, but can be controlled by the project management. Openings should be maintained by cultivation, burning, or mowing, and some crops and cover fields rotated periodically. To avoid detrimental effects on the furbearing population, water levels should be as constant as possible during the fall and winter. Shallow water areas that will become marshes and perhaps act as silt ponds should be created. Small game hunting should be allowed unless conflicting uses develop and should be controlled by the project's governing agency. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08165

BIOTIC ASPECTS--TERRESTRIAL VEGETATION,
Wisconsin Univ., Madison. Dept. of Botany.
V. M. Kline.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 190-210. 1 fig, 10 tab, 7 ref. DACW 37-C-0130.

Descriptors: *Vegetation, *Plant populations, *Impoundments, Land use, Wisconsin, Roads, Forests, Runoff, Watersheds(Basins), Plant groupings, Varieties, Erosion control, Conservation, Water resources development, Grazing.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

A survey of vascular plants growing without cultivation in the watershed of the proposed La Farge impoundment on the Kickapoo River identified 488 species. Some rare species were observed. One ridge top was an example of a dry prairie and should be preserved. On the cliffs along the river there were four plant species on the rare or endangered list. Three of these will be lost during filling and the fourth species will be substantially reduced. Aerial photographs used to estimate the amount of vegetative cover showed that approximately one-third was cultivated, one-third pasture and open woods, and one-third woods. A grazing index was calculated and identified 28 species of trees, 44 shrubs, and 173 herbs and vines. Natural forest vegetation can provide steep slopes with protection from erosion, but cattle grazing and the presence of plowed fields and roads above wooded slopes increased erosion. It is recommended that cattle be excluded from woodlots in the watershed; a buffer strip of grass or permanent vegetation be maintained between the cultivated fields and the woods; and that roads be engineered so that runoff is not channelled down wooded slopes. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08166

POTENTIAL MACROPHYTE PRODUCTION AND MANAGEMENT STRATEGIES FOR LA FARGE LAKE,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
F. B. Richardson.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 211-249. 13 fig, 8 tab, 41 ref. DACW 37-C-0130.

Descriptors: *Water resources development, *Impoundments, *Forecasts, *Aquatic plants, Wisconsin, Nutrients, Nitrogen, Phosphorus, Submerged plants, Nutrient removal, Biomass, Standing crops, Absorption, Reservoirs, Aquatic weed control, Drawdown, Management, Trophic level, Algae, Succession.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

To evaluate macrophyte development in the proposed La Farge Lake on the Kickapoo River, basic physical data for the impoundment basin were obtained from a bathymetric map derived from contour maps and compared with data for other impoundments in the area. Predicted nutrient loads (nitrogen and phosphorus) indicated that La Farge will be mildly to grossly eutrophic. To predict potential macrophyte development, a survey of species in other impoundments and determination of macrophyte biomass and nutrient content were made; there was no evidence of consistent nutrient limitation in the macrophytes sampled. Using a simulation model, it was estimated that La Farge Lake will support submergent macrophyte maximum standing crops to 400 g/sq m. Species likely to compose the initial vegetation were Ceratophyllum demersum, Potamogeton, and Elodea canadensis. Plant management in the reservoir should include identification of recreation areas were plant control would provide maximum benefit; plant control by basin contouring and harvesting; and intentional propagation of beneficial species. Vegetative nutrient uptake may be insignificant compared to total nutrient influx, but may have moderating effects on 'downstream' primary production in early summer. Drawdown is the most practical method of large-scale vegetation control, but may encourage species tolerant of fluctuating water levels. (See also W75-08158) (Buchanan-Davidson-Wisconsin)
W75-08167

LAND USE TRENDS IN THE KICKAPOO VALLEY AND THE ARMY CORPS OF ENGINEERS PROPOSED IMPOUNDMENT,
Wisconsin Univ., Madison. Natural Resource Economics.
G. D. Phillips, and G. R. Dirks.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 250-287. 12 fig, 2 tab, 45 ref, 3 append. DACW 37-C-0130.

Descriptors: *Water resources development, *Economic impact, *Land use, Recreation, Urbanization, Impoundments, Watershed management, Wisconsin, Water quality, Projections, Tax rates, Property values, Aesthetics, Methodology, Zoning, Regulation, Reservoirs.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

The real estate market in the Kickapoo River Valley in Vernon and Monroe Counties, Wisconsin, was analyzed in order to isolate trends and make projections about future land use. Real estate transactions have been intense, and apparently there is speculation on the development of a recreation industry. A transition from an agriculturally-based economy to a recreationally-based economy is underway. More small acreages are being sold and the price per acre has increased 152% from 1968-73. Development will probably be haphazard and involve marginal agricultural land. Continued relatively high increases in land prices will discourage additional hobby farm purchases. There is low potential for lot-by-lot development. Lands designated as development districts in a proposed zoning ordinance should be adequate to accomodate anticipated lot development. Prime agricultural lands must be protected. The area can develop the recreation industry but should protect the scenic bluffs, woodlands, and agricultural enterprises. Land use zoning should be strengthened. New commercial development should be guided to the villages. Overgrazing of pastures and woodlots and removal of fencerows must be controlled by zoning and establishment of soil and water conservation districts. The economic viability of the valley depends on both agriculture and recreation, the latter contingent on the water quality of the impoundment. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08168

COST OF ESTABLISHMENT AND OPERATION OF WATER IMPROVEMENT PROCEDURES,
Wisconsin Univ., Madison. Inst. for Environmental Studies.
G. Cottam.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 288-291. DACW 37-C-0130.

Descriptors: *Water quality control, *Impoundments, *Estimated costs, Wisconsin, Algal control, Algicides, Stream improvement, Aquatic weed control, Operation and maintenance, Farm management, Aeration, Monitoring, Waste treatment, Projections, Harvesting, Land management, Cost analysis, Reservoirs, Earth dams.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

Estimates of some of the costs related to the maintenance of water quality in the La Farge Impoundment on the Kickapoo River were made, assuming that Lake La Farge will support a large macrophyte biomass in places less than seven feet deep, that there will be extensive algal blooms, and that the hypolimnion will become anoxic. A minimal management plan to enhance the use of the lake as a swimming-fishing-boating lake would require $25,000 to $57,000 annual costs and includes the use of copper sulfates or organic copper compounds as algicides; limited harvesting of macrophytes adjacent to beaches, land access points, and intense use areas; and monitoring to determine when and where to initiate control procedures. Cost estimates are also given for a more comprehensive management program, which would involve the use of aeration structures to add oxygen to the hypolimnion without destratifying the lake. Hypolimnetic aerators would displace the hydrogen sulfide odor from the outlet to the middle of the lake and prevent nighttime downstream oxygen sag. Additionally, municipal sewage plants should be improved, farmstead management programs established, sediment dams erected in fourth order streams, reservoirs contoured to encourage marshes and macrophytes, flood retarding structures constructed downstream and fensing built. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08169

ON THE MEASUREMENT OF ENVIRONMENTAL IMPACTS OF PUBLIC PROJECTS FROM A SOCIOLOGICAL PERSPECTIVE,
East Texas State Univ., Commerce. Dept. of Sociology and Anthropology.
R. N. Singh, and K. P. Wilkinson.
Water Resources Bulletin, Vol 10, No 3, p 415-425, June 1974. 1 fig, 2 tab, 45 ref.

Descriptors: *Measurement, *Projects, *Watersheds(Basins), *Attitudes, Data collections, River basins, Environment, Reservoirs, Dams, *Texas, Planning, Cost-benefit ratio, Political aspects, Psychological aspects, Social aspects.
Identifiers: *Environmental impact, Development programs, Sociological approach, Residents, Physical sciences, Guttman scale, Correlation matrix, Cooper Reservoir(Tex).

Objectives are to (1) identify the problems involved in measuring the environmental impacts of public projects from selected perspectives, and (2) elaborate a sociological approach used in an empirical investigation in that respect. The construct of environmental impact of a planned action is generally operationalized from different perspectives and with different methodological emphases in the various disciplines. Although there has been a steady increase in the number of studies from a sociological perspective concerning environmental problems, there is lack of sociological counsel in writing environmental impact statements, sociological methodology and operational procedures for that purpose are wanting. Attitudinal measures employed to find how residents of a river basin perceived negative and positive environmental impacts of a proposed watershed development project are reviewed. These come from a study of creation of the Cooper Reservoir and Dam in Texas. Data on 343 heads of households in the selected areas were collected through structured questionnaires with items on personal information, a vested interest scale, a knowledge of the project scale, and an environmental impact scale. Data show that perception of impacts by residents is influenced significantly by degree of their vested interests involved. Four categories of variables for inclusion in a sociological model of environmental impact are suggested: economic development; provision of services and amenities; human welfare; and collective viability. (Bell-Cornell)
W75-08203

WATER AND THE ENERGY CRISIS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W75-08210

THE PROTECTION OF NATURE AS REFLECTED IN THE WORK OF THE FIRST UNITED NATIONS CONFERENCE OF THE ENVIRONMENT (STOCKHOLM, 1972), (IN ROMANIAN),
Consililul National al Apelor, Bucharest (Rumania).
C. Radescu.
Ocrotirea Nat, Vol 17, No 1, p 37-44, 1973, Illus.

Descriptors: *Pollution, Water pollution, *Environmental control, Environment protection, Flora, Fauna, Water pollution, Oceans, Seas, *Conferences, Conservation, Natural resources, Water resources.
Identifiers: *United Nations.

A description of the organization and results of the conference are given. The most important subjects studied included the management of human habitation and natural resources from the point of view of the environment and the determination of pollutants of international importance. The protection of nature, including flora, fauna soil, water and genetic resources, was also a major theme. The conference recommended national natural reservations and protected zones and national laws for the protection of wildlife. Supervision of the introduction of new species to avoid displacing indigenous species was also mentioned. International action recommendations included the publication of an annual assessment of fauna by the United Nations, and international programs for the protection of genetic resources, forests and water resources. Pollution was emphasized as an international danger affecting soil and water resources and climate. International supervision of the effect of pollution, especially of the oceans and seas, was recommended.--Copyright 1974, Biological Abstracts, Inc.
W75-08241

NATURAL RESOURCES IN MODERN WORLD AND THE PROBLEM OF THEIR CONSERVATION, (IN ROMANIAN),
Academia R. S. R., Cluj. Centrul de Cercetari Biologice.
V. Soran.
Octrotirea Nat, Vol 17, No 1, p 51-57, 1973. English summary.

Descriptors: *Natural resources, *Conservation, *Protection, Pollution, Pesticide toxicity, Ecosystems, Balance of nature, Water pollution effects, Effects, Environmental effects.

The problem of natural resources and their conservation in the modern world are discussed, starting from the idea that Earth and its goods are limited and that during the past 3000 or 4000 yr of history all the main natural resources (soil, water and air) were successively transformed into wares. The pollution problem and the effects of different chemicals, especially pesticides, on natural ecosystems are also presented. Stressed are the measures which must be taken to avoid ecological disaster, with emphais on the new era in man-nature relationships grounded on a rational equilibrium between the development of human society and the real possibilities of the environment to support it.--Copyright 1974, Biological Abstracts, Inc.
W75-08274

ARIDITY PROBLEMS IN THE SAHEL, TWENTY YEARS OF UNESCO ACTIVITY.
For primary bibliographic entry see Field 2A.
W75-08282

BIRDS AND MAMMALS OF ANEGADA ISLAND, BRITISH VIRGIN ISLANDS,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 2I.
W75-08317

THE BREACH IN THE FLOW OF MINERAL NUTRIENTS,
For primary bibliographic entry see Field 5B.
W75-08319

7. RESOURCES DATA

7A. Network Design

ANALYSIS OF ERTS-RELAYED WATER-RESOURCES DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Harrisburg, Pa.
For primary bibliographic entry see Field 7C.
W75-07871

HYDROLOGIC DATA NEEDS FOR SMALL WATERSHEDS--STREAMFLOW AND RELATED PRECIPITATION DATA.
Geological Survey, Reston, Va.
Office of Water Data Coordination, Interagency Advisory Committee on Water Data, December 1974. 58 p, 4 fig, 52 tab, 56 ref.

Descriptors: *Basic data collections, *Hydrologic data, *Small watersheds, *Network design, Streamflow, Floods, Design flow, Discharge measurement, Precipitation(Atmospheric).
Identifiers: Data needs.

A Federal Interagency Work Group, impaneled in 1971 by the Office of Water Data Coordination, Geological Survey, recommends a data-collection system to provide the streamflow information needed for planning and designing water resources related projects on small watersheds. The recommended data-collection system was designed to provide sufficient base data for estimating selected flow characteristics at those ungaged sites having a drainage area less than 50 square miles, where the flow is virtually natural, where runoff from urban basins occurs in open channels, and where any upstream reservoirs or diversions have fixed control structures. The selected flow characteristics are those commonly used in planning and designing projects on small streams, and include the magnitude and frequency of flood peaks and of flood volumes for durations of 1 to 15 days, the mean and variability of annual and monthly flows, and the time and shape characteristics of flood hydrographs. The recommended system is expected to provide sufficient data for estimating flow characteristics at ungaged sites with a reliability equivalent to the reliability of determinations from 10 years of observed flow records. (Knapp-USGS)
W75-07874

DATA REQUIREMENTS OF A WATER QUALITY MANAGEMENT PROGRAM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-08213

7B. Data Acquisition

INTERPRETATION--APOLLO 9 PHOTOGRAPHY OF PARTS OF SOUTHERN ARIZONA AND SOUTHERN NEW MEXICO,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 7C.
W75-07861

REMOTE SENSING TECHNIQUES FOR EVALUATION OF URBAN EROSION AND SEDIMENTATION,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 4C.
W75-07880

A SINGLE-BEAM INFRARED HYGROMETER FOR EVAPORATION MEASUREMENT,
Commonwealth Scientific and Industrial Research Organization, Aspendale (Australia). Div. of Atmospheric Physics.
For primary bibliographic entry see Field 2D.
W75-07901

THE MEASUREMENT OF WATER CONTENT BY AN EVAPORATOR,
National Center for Atmospheric Research, Boulder, Colo.
For primary bibliographic entry see Field 2D.
W75-07902

MODE: IGPP MEASUREMENTS OF BOTTOM PRESSURE AND TEMPERATURE,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
F. Snodgrass, W. Brown, and W. Munk.
Journal of Physical Oceanography, Vol 5, No 1, p 63-74, January 1975. 15 fig, 1 tab, 7 ref. ONR Contract N00014-69-A-0200-6008, NSF Grant GX-29052.

Descriptors: *Instrumentation, *Temperature, *Pressure, *Oceans, Measurement, Equipment, Oceanography, On-site investigations, Laboratory tests, Electrical equipment.
Identifiers: *Ocean bottom pressure, *Instrument noise, Mid-Ocean Dynamics Experiment, Temperature sensors, Underwater pressure sensors.

The Mid-Ocean Dyanmics Experiment (MODE) deployment of the Institute of Geophysics and Planetary Physics bottom instruments was reviewed, together with preliminary tests on the Pacific seafloor and in the laboratory. Pressure and temperature were measured with quartz-crystall transducers in different configurations. Spectra of instrument noise in the laboratory and on the seafloor were estimated from duplicate transducers. These estimates are prerequisite to the forthcoming discussions of MODE tides, and bottom experiment, and internal waves. There are two puzzling features: (1) the temperature noise continuum on the seafloor is generally 20 dB above that in the laboratory, and (2) the pressure noise spectrum has a tidal line structure. Instrument drifts during MODE are of the order of a few millibars and a millidegree Celcius, respectively. (Sims-ISWS)
W75-07904

MODE BOTTOM EXPERIMENT,
California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics.
W. Brown, W. Munk, F. Snodgrass, H. Mofjeld, and B. Zetler.
Journal of Physical Oceanography, Vol 5, No 1, p 75-85, January 1975. 15 fig, 7 ref, 1 append. ONR Contract N00014-69-A-0200-6008; NSF Grant GX-29052.

Descriptors: *Oceans, *Pressure, *Temperature, Oceanography, Measurement, On-site investigations, Model studies, Mathematical models, Ocean circulation, Atmospheric pressure, Atlantic Ocean.
Identifiers: *Ocean bottom pressure, Mid-Ocean Dynamics Experiment.

Pressure fluctuations on the deep seafloor at frequencies below inertial and tidal were measured. Between 0.1 and 1 cycle per ay the variance is about 2 sq mb, spectra diminish with increasing frequency as omega to the (-n) power, n = 1.5 to 2, and a signal-to-instrument noise ratio of 10 dB is achieved. Fluctuations are in phase and highly coherent within the MODE area (greater than 0.9 at 200 km) and even with inferred (atmosphere plus sea level) Bermuda subsurface pressures (0.8 at 700 km). Station differences (to which MODE-sized eddies would make the principal contribution) are relatively small. The large horizontal scale of the recorded bottom pressure fluctuation resembles that of atmospheric pressure, yet the coherence locally between atmospheric and bottom pressure is slight; and recorded fluctuations may be related to a barotropic ocean response to a variable wind stress on the subtropical gyre. Bottom temperature records show 'sudden' (1 day) changes of order 30 millidegrees Celsius separated by long intervals (20 days) of uniform temperatures. The changes are much larger than have been observed in the Pacific. They are correlated at horizontal separations of 2 km, but uncorrelated to bottom pressure and to temperatures 1 km above the seafloor. (Sims-ISWS)
W75-07905

ELECTRONIC DIGITIZATION AND SENSOR RESPONSE EFFECTS ON SALINITY COMPUTATION FROM CTD FIELD MEASUREMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W75-07914

OBSERVATIONS OF OCEANIC INTERNAL AND SURFACE WAVES FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
J. R. Apel, H. M. Byrne, J. R. Proni, and R. L. Charnell.
Journal of Geophysical Research, Vol 80, No 6, p 865-881, February 20, 1975. 17 fig, 14 ref.

Descriptors: *Internal waves, *Remote sensing, Satellites(Artificial), Oceans, Seashores, Con-

tinental shelf, *Waves(Water), Wavelengths, Velocity, Tides, Data processing, *Ocean waves.
Identifiers: *ERTS.

Periodic features observed on the ocean surface from the Earth Resources Technology Satellite 1 were interpreted as surface slicks due to internal wave packets. They appear to be generated at the edge of the continental shelf by semidiurnal and diurnal tidal actions and propagate shoreward. Nonlinear effects apparently distort the wave packets as they progress across the shelf. This observational technique constitutes a new tool for delineating two dimensions of the internal wave field under certain limited conditions. (Sims-ISWS)
W75-07920

EVALUATING SURFACE-SOIL WATER CONTENT BY MEASURING REFLECTANCE,
Agricultural Research Service, Manhattan, Kans.
For primary bibliographic entry see Field 2G.
W75-07943

SOIL MOISTURE MEASUREMENT AND ASSESSMENT,
Australian Water Resources Council, Canberra.
For primary bibliographic entry see Field 2G.
W75-07952

METHODS FOR CALCULATING UNSATURATED HYDRAULIC CONDUCTIVITY AND SOIL WATER DIFFUSIVITY DURING VERTICAL INFILTRATION IN A DRY SOIL,
Ghent Rijksuniversiteit (Belgium). Soil Physics, Soil Conditioning and Horticultural Soil Sciences Lab.
For primary bibliographic entry see Field 2G.
W75-08064

THE EFFECT OF STABILITY ON EVAPORATION RATES MEASURED BY THE ENERGY BALANCE METHOD,
Macquarie Univ., North Ryde (Australia). School of Earth Science.
For primary bibliographic entry see Field 2D.
W75-08088

SUSPENDED SOLIDS MONITOR,
Newark Coll. of Engineering, N.J.
For primary bibliographic entry see Field 5A.
W75-08227

MEASUREMENT OF MICROBIAL OXIDATION OF METHANE IN LAKE WATER,
Manitobe Univ., Winnipeg. Dept. of Microbiology.
For primary bibliographic entry see Field 5A.
W75-08323

7C. Evaluation, Processing and Publication

ANNUAL WATER-RESOURCES REVIEW, WHITE SANDS MISSILE RANGE, 1974, A BASIC-DATA REPORT,
Geological Survey, Albuquerque, N Mex.
For primary bibliographic entry see Field 4B.
W75-07857

A SUMMARY OF SELECTED CHEMICAL-QUALITY CONDITIONS IN 66 CALIFORNIA STREAMS, 1950-72,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 5A.
W75-07858

INTERPRETATION--APOLLO 9 PHOTOGRAPHY OF PARTS OF SOUTHERN ARIZONA AND SOUTHERN NEW MEXICO,
Geological Survey, Denver, Colo.
J. R. Owen, and L. M. Shown.
Open-file report, February 1973. 18 p, 4 fig.

Descriptors: *Remote sensing, *Aerial photography, *Vegetation effects, *New Mexico, *Arizona, Arid lands, Deserts, Mapping, Terrain analysis.

Examination of small-scale (approximately 1:650,000) multispectral photographs obtained on the Apollo 9 mission in March 1969 revealed that in semiarid regions features due to differences in soils or quantity of vegetation could most easily be discriminated on the color infrared photographs. Where there is sufficient ground truth, it is possible to delineate regional wildland plant communities on the basis of tone. The precision of the method may be improved by using photographs obtained two or more times during the year. Sites where vegetation-improvement practices have been completed are not always discernible. For example, where waterspreaders have been constructed, there was sufficient change in the density of vegetation to be readily detected on the photographs; however, pinyonjuniper to grass conversions or contour furrowing did not always produce a sufficient change in the vegetation to be detected on the photographs. (Knapp-USGS)
W75-07861

ANALYSIS OF ERTS-RELAYED WATER-RESOURCES DATA IN THE DELAWARE RIVER BASIN,
Geological Survey, Harrisburg, Pa.
R. W. Paulson.
In: Management and Utilization of Remote Sensing Data; Proceedings of Symposium, October 29-November 1, 1973, Sioux Falls, S Dak: American Society of Photogrammetry, p 191-205, 1973. 8 fig, 1 tab.

Descriptors: *Delaware River, Delaware River Basin Commission, *Data collections, *Data transmission, *Telemetry, Satellites(Artificial), Hydrologic data, Water wells, Water levels, Floods, Water quality, Gaging stations, Monitoring, *Remote sensing.
Identifiers: *ERTS.

The U.S. Geological Survey, in cooperation with the National Aeronautics and Space Administration, the Earth Resources Observations System Program of the Department of the Interior, and the Delaware River Basin Commission, studied the feasibility of relaying hydrologic data operationally from water-resources stations in the Delaware River basin, using the Data Collection System on the Earth Resources Technology Satellite. Battery-operated radios, called Data Collection Platforms, transmit data to the satellite from 20 hydrologic stations in the basin. These stations include groundwater observation wells, stream-gaging stations, and water-quality monitors. Analysis of these data indicates that the Data Collection System works well, and that such a system has the potential for being used as an operational tool by water-data collection agencies. (Knapp-USGS)
W75-07871

HYDROLOGIC DATA NEEDS FOR SMALL WATERSHEDS--STREAMFLOW AND RELATED PRECIPITATION DATA.
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 7A.
W75-07874

WATER RESOURCES DATA FOR NEBRASKA, 1973: PART 1. SURFACE WATER RECORDS.
Geological Survey, Lincoln, Nebr.
Data Report, 1974. 200 p, 2 fig, 1 tab, 3 ref.

Descriptors: *Basic data collections, *Nebraska, *Hydrologic data, Streamflow, Stage-discharge relations, Lakes, Reservoirs, Gaging stations.

The surface-water records for the 1973 water year for gaging stations, partial-record stations, and miscellaneous sites within the State of Nebraska are given in this report. The base data collected at gaging stations consists of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. The description of the gaging station gives the location, drainage area, period of record, type and history of gages, average discharge, extremes of discharge or contents, and general remarks. (Knapp-USGS)
W75-07879

HARMONIC ANALYSIS OF STREAM TEMPERATURES,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5B.
W75-07882

ONE-DIMENSIONAL STREAM EXCESS TEMPERATURE ANALYSIS,
Geological Survey, Bay Saint Louis, Miss.
For primary bibliographic entry see Field 5B.
W75-07883

INDEX OF CURRENT WATER RESOURCES PROJECTS AND DATA COLLECTION ACTIVITIES IN OHIO, 1975.
Geological Survey, Columbus, Ohio.
Project report, January 1975. 26 p.

Descriptors: *Basic data collections, *Hydrologic data, *Ohio, Projects, Water resources.

The water-resources program of the U.S. Geological Survey in Ohio consists of the collection of basic information through its research projects, areal hydrologic studies, and hydrologic data stations. This index consists of two parts; Part A--a listing of current projects and Part B--a listing of hydrologic data-collection stations. Tables show station numbers and names, types of data collected, and projects benefiting from the data collected at the site. (Knapp-USGS)
W75-07886

WATER-RESOURCES INVESTIGATIONS OF THE U.S. GEOLOGICAL SURVEY IN THE NORTHERN GREAT PLAINS COAL REGION OF NORTHEASTERN WYOMING, 1974-75.
Geological Survey, Cheyenne, Wyo.
Open-file report, March 1975. 28 p, 9 fig, 27 ref.

Descriptors: *Water resources, Bibliographies, *Wyoming, *Coal mines, *Investigations, Surveys, Data collections, Hydrologic data, Exploration, *Great Plains.

The U.S. Geological Survey has four data-collection activities and five water-resource appraisal projects in the Northern Great Plains coal region of northeastern Wyoming (the Powder River structural basin). The data-collection activities include: (1) streamflow measurements; (2) measurements of water levels in wells; (3) sampling and chemical analysis of water from streams and wells; and (4) sampling and sediment analysis of water from streams. The water-resource appraisal projects include: (1) water resources of Weston County, Wyoming; (2) measurement of water losses to the Madison Limestone and associated rocks from streams in northeastern Wyoming; (3) hydrology of Paleozoic rocks in the Powder River basin and adjacent areas, northeastern Wyoming; (4) water

resources of the Powder River structural basin in Wyoming in relation to energy development; and (5) availability of groundwater from the Cretaceous and Tertiary aquifers of the Fort Union Coal Region. A listing of selected reports by USGS authors is included to give an indication of what has been done in the past. (Knapp-USGS)
W75-07887

WATER QUALITY OF HYDROLOGIC BENCH MARKS--AN INDICATOR OF WATER QUALITY IN THE NATURAL ENVIRONMENT,
Geological Survey, Reston, Va.
For primary bibliographic entry see Field 5A.
W75-07888

COMPUTER SIMULATION OF SEDIMENTATION IN MEANDERING STREAMS,
Queens Univ., Belfast (Northern Ireland). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W75-07891

DIGITAL SIMULATION MODEL OF AQUIFER RESPONSE TO STREAM STAGE FLUCTUATION,
California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 2F.
W75-07897

ROTARY CROSS-BISPECTRA AND ENERGY TRANSFER FUNCTIONS BETWEEN NON-GAUSSIAN VECTOR PROCESSES I. DEVELOPMENT AND EXAMPLE,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 2E.
W75-07911

WASTEWATER MANAGEMENT ACTIVITIES AT THE BROOKHAVEN NATIONAL LABORATORY,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 5D.
W75-07961

ESTIMATING LAND USE CHARACTERISTICS FOR HYDROLOGIC MODELS,
Rummel, Klepper and Kahl, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-07982

A STOCHASTIC DYNAMIC PROGRAMMING MODEL FOR THE OPTIMUM OPERATION OF A MULTI-PURPOSE RESERVOIR,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W75-07988

ON THE MOISTURE BETWEEN DATA AND MODELS OF HYDROLOGIC AND WATER RESOURCE SYSTEMS,
Arizona Univ., Tuscon. Dept. of Management.
For primary bibliographic entry see Field 6A.
W75-07989

WATER RESOURCES PLANNING, SOCIAL GOALS AND INDICATORS: METHODOLOGICAL DEVELOPMENT AND EMPIRICIAL TEST.
Utah State Univ., Logan. Technical Committee of the Water Resources Research Center of the Thirteen Western States.
For primary bibliographic entry see Field 6B.
W75-07997

DEVELOPING BIOLOGICAL INFORMATION SYSTEMS FOR WATER QUALITY MANAGEMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W75-08002

DIGITAL SIMULATION OF THE EFFECT OF THERMAL DISCHARGE ON STREAM WATER QUALITY,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5B.
W75-08006

SPECIAL FLOOD HAZARD REPORT: CHESTER CREEK, GREATER ANCHORAGE AREA,
Army Engineer District, Anchorage, Alaska.
For primary bibliographic entry see Field 4A.
W75-08173

FLOOD PLAIN INFORMATION: CROW CREEK, CHEYENNE, WYOMING,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-08174

FLOOD PLAIN INFORMATION: SAN DIEGO CREEK AND PETERS CANYON WASH, ORANGE COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08175

FLOOD PLAIN INFORMATION: MARAIS DES CYGNES RIVER, MELVERN TO OTTOWA, KANSAS, VOLUME 1.
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4A.
W75-08176

FLOOD PLAIN INFORMATION: WILSON AND WILDWOOD CREEKS, SAN BERNADINO COUNTY, CALIFORNIA,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08178

FLOOD PLAIN INFORMATION, ALLEGHENY RIVER, CLARION COUNTY, PENNSYLVANIA,
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 4A.
W75-08179

FLOOD PLAIN INFORMATION: BEAVERDAM CREEK, HANOVER COUNTY, VIRGINIA,
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-08180

FLOOD PLAIN INFORMATION: RAPID CREEK, RAPID CITY, SOUTH DAKOTA,
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W75-08183

FLOOD PLAIN INFORMATION: VIRGIN RIVER AND FORT PIERCE WASH, VICINITY OF ST. GEORGE, WASHINGTON COUNTY, UTAH,
Army Engineer District, Los Angeles, Calif.
For primary bibliographic entry see Field 4A.
W75-08184

COLLECTION OF BASIC DATA ON REPRESENTATIVE AND EXPERIMENTAL BASINS (IN FRENCH),
P. Dubreuil, Chaperon, P. J. Guiscafre, and J. Herbaud.
Office de la Recherche Scientifique et Technique Outre-Mer: Paris, France, 1972. 916 p, Illus.

Descriptors: *Africa, Rainfall, Hydrology, *Basins, River basins, Lake basins, *South America, *Tropical regions, Geomorphology, Topography, Climate, Geology, Vegetation, Soils, Drainage patterns, *Basic data collections.
Identifiers: Brazil, Climates, Drainage, Equatorial, Geology, Guadeloupe, Guiana, Hydrology, Madagascar, New-Caledonia, Rainfall, Representative, Soils, Vegetation, Water.

This volume contains data on areas surrounding bodies of water or rivers situated mainly in West and Equatorial Africa, with some additional data from Madagascar, New Caledonia, French Guyana, Guadeloupe and Brazil. For each region the material is classified under 10 headings, including observations and measures of water levels, rainfall, hydrology, geomorphology, physical characteristics, topographic maps and equipment, regional climate, geology, vegetation, soils and drainage. Each basin represents an area of various size surrounding a river or a chain of lakes. In most cases the basin is only a small part of the country.--Copyright 1974, Biological Abstracts, Inc.
W75-08198

AN APPLICATION OF DISCRIMINANT ANALYSIS TO PREDICT INDUSTRIAL/COMMERCIAL FLOOD PLAIN LOCATION,
Missouri Univ., St. Louis.
For primary bibliographic entry see Field 6F.
W75-08208

DATA REQUIREMENTS OF A WATER QUALITY MANAGEMENT PROGRAM,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W75-08213

CHARACTERIZATION OF OPTIMAL OPERATING POLICIES FOR FINITE DAMS,
California Univ., Los Angeles. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W75-08223

FORTRAN PROGRAMS FOR ANALYZING COLLABORATIVE TEST DATA, PART I: GENERAL STATISTICS,
National Environmental Research Center, Cincinnati, Ohio.
E. C. Julian.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 707, $3.75 in paper copy, $2.25 in microfiche. Report EPA-670/4-75-004a, April 1975. 38 p, 2 ref. 1HA327 ROAP 24EL; Task 006.

Descriptors: Laboratory tests, Statistics, *Computer programs, Testing, *Programming languages, *Analytical techniques, *Statistical methods, Pollutant identification, Data processing.
Identifiers: *Collaborative tests, *Fortran computer programs, Scatter diagrams.

A FORTRAN program for IBM 1130 is described by which general statistics on inter-laboratory studies of chemical analytical methods may be obtained. Data screening followed by a statistical t-test for identifying outliers is included. A histogram of data in ascending order is provided. (See also W75-08231) (EPA)
W75-08230

FORTRAN PROGRAMS FOR ANALYZING COLLABORATIVE TEST DATA, PART II: SCATTER DIAGRAMS,
National Environmental Research Center, Cincinnati, Ohio.
E. C. Julian.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-241 708 $3.75 in paper copy, $2.26 in microfiche. Report EPA-670/4-75-0046, April 1975. 29 p, 1 fig, 3 ref. 1HA327, ROAP 24AEL; Task 006.

Descriptors: *Computer programs, Statistical methods, Data processing, Testing, Programming language, Pollutant identification, Analytical techniques, Laboratory tests.
Identifiers: *Collaborative tests, *Scatter diagrams, *Fortran computer program.

A FORTRAN program for IBM 1130 designed to plot three pairs of data sets in three scatter diagrams on one page is described. These data stem from interlaboratory studies of chemical analytical methods. (See also W75-08230) (EPA)
W75-08231

PREDICATION OF THE BALANCE OF MATTER IN STORAGE RESERVOIRS BY MEANS OF CONTINUOUS OR SEMICONTINUOUS BIOLOGICAL MODELS: II. RELIABILITY OF THE PREDICTION METHOD, (IN GERMAN),
Technische Universitaet, Dresden (East Germany). Bereich Hydrobiologie.
For primary bibliographic entry see Field 5G.
W75-08273

8. ENGINEERING WORKS

8A. Structures

SEISMIC RESPONSE OF RESERVOIR-DAM SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W75-07930

WATER RESOURCES DEVELOPMENT BY THE U.S ARMY CORPS OF ENGINEERS IN ARIZONA,
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W75-07979

UPPER THOMPSON SANITATION DISTRICT, PROJECT NO. C 080322 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W75-08016

MAINTENANCE OF BUTTERMILK CHANNEL, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-NY-73-1872-F, $3.75 in paper copy, $2.25 in microfiche. November 28, 1973. 43 p, 3 map, 5 tab.

Descriptors: *Dredging, *Disposal, *Channels, Excavation, Navigation, Turbidity, *New York, Environmental effects, Channeling, Oceans, Incineration, Aerobic conditions.
Identifiers: *Environmental impact statements, *Buttermilk Channel(NY).

The project entails the dredging of Buttermilk Channel to authorized federal project dimensions. Disposal of the excavated material will be in the approved dumping ground in the New York Bight. The environmental impacts of the proposed project consist of the excavation and disposal of 500,000 cubic yards of bottom materials, continuation of the economy of commodity transportation, and increased safety in navigation. Adverse environmental effects include construction disturbance due to the disruption of channel bottom or associated life and the generation of turbidity and the disposal of excavated material at the already degraded approved dumping area in the New York Bight. Alternatives to the enlargement include the continued use of the present channel or use of other modes of commodity transportation. The alternatives to ocean disposal of the dredged materials are placement in upland areas, high temperature incineration, aerobic stabilization, placement in leveed areas in open waters and disposal of materials farther out to sea than the approved location. (Gagliardi-Florida)
W75-08017

CORBELL HULL DAM AND RESERVOIR, CUMBERLAND RIVER, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Nashville, Tenn.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-TN-73-1620-F, $4.25 in paper copy, $2.25 in microfiche. October 11, 1973. 62 p, 6 tab, 3 map, 8 ref.

Descriptors: *Hydroelectric plants, *Environmental effects, *Multiple-purpose reservoirs, Reservoirs, Reservoir operation, Impoundments, Impounded waters, Water management(Applied), Cost-benefit analysis, Project planning, Project benefits, Dams, Economic impact, Ecosystems, *Tennessee, Recreation, Fishing.
Identifiers: *Cordell Hull Dam and Reservoir(Tenn), *Environmental impact statements, Carthage(Tenn), *Cumberland River(Tenn).

Construction of the dam, now 89% complete, on the Cumberland River near Carthage, Tennessee, will constitute a major unit in the comprehensive plan for the development of the Cumberland River Basin. Completion of the dam, including an 84 x 400 foot navigation lock, a 100-megawatt power facility, a spillway, and the 12,209 acre reservoir, will provide a cheap and efficient source of power, introduce new industrial potential to the area, enhance navigation and outdoor recreation, and attract attention to several historical points of interest. Adverse environmental effects will be experienced, in a potential threat of cold-water fisheries by introduction of warm-water lake-type fishes, loss of 9,428 acres of terrestrial space, loss of 750 man-days of hunting, conversion of 72 miles of free-flowing stream to impoundment, introduction of new industry with potential for industrial sprawl, temporary adverse effects due to construction activity, and downstream bank erosion. However, these effects are not considered of major importance and are outweighed by the beneficial results expected on completion of the dam. Suggested alternatives were found unhelpful, particularly in light of the present stage of construction. (Ostapoff-Florida)
W75-08020

PALATLAKAHA RIVER WATERSHED, LAKE COUNTY, FLORIDA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Gainesville, Fla.
Available from National Technical Information Service, U.S. Dept. of Commerce, as EIS-FL-73-0959-F, $5.25 in paper copy, $2.25 in microfiche. April 1973. 123 p, 4 map, 1 tab, 5 fig.

Descriptors: *Watershed management, *Water control, *Flood damage, *Floodwater, Erosion, Sediments, Water, Water management(Applied), *Florida, Channels, Recreation, Velocity, Fishing, Irrigation, Citrus fruits, Marshes, Wildlife, Wetlands, Sedimentation, Flood plains, Flood plain zoning, Fish, Flood plain insurance.
Identifiers: *Environmental impact statements, Lake County(Fla).

The action involves implementation of a watershed project to be carried out with federal assistance in Lake County, Florida. The project includes the installation of needed conservation land treatent measures, 6.2 miles of channel improvement, eight structures for water control and five grade stabilization structures with water control features. The project will reduce floodwater damages; reduce areas of erosion and sediment production; create an additional 370 acres of water; improve water management; reduce excessive velocities; improve recreational and fishing opportunities; add 45 acres for future recreation sites; provide front abatement and increased irrigation resources; improve income prospects for the citrus industry; protect 1350 acres of marshland from future development; recharge isolated marshes; assure continuation of wildlife production and use of the wetlands; divert 81 acres of rangeland to recreation and spoil areas; and create temporary sedimentation problems and erosion of bare areas. The following alternatives were considered: a system of channel improvements; grade stabilization and water control structures; additional storage of floodwater; floodplain zoning; public ownership of flood damage areas; additional funds for expansion of fish and wildlife and recreational resources; land treatment without structural measures; flood insurance; and no project. (Gagliardi-Florida)
W75-08022

SHOAL CREEK CHANNEL, CHARITON-LITTLE CHARITON BASINS, MISSOURI (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Kanasa City, Mo.
For primary bibliographic entry see Field 4A.
W75-08024

FOURMILE RUN LOCAL FLOODPLAIN PROTECTION, CITY OF ALEXANDRIA AND ARLINGTON COUNTY, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
For primary bibliographic entry see Field 4A.
W75-08025

HAMPTON CREEK NAVIGATION PROJECT (MAINTENANCE DREDGING) HAMPTON, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
For primary bibliographic entry see Field 4A.
W75-08026

CENTRAL AND SOUTHERN FLORIDA PROJECT, LAKE OKEECHOBEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
For primary bibliographic entry see Field 4A.
W75-08027

LAKEVIEW LAKE, MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Forth Worth, Tex.
Available from National Technical Information Service, Springfield, Va as USDC, EIS-TX-73-1760-F, $5.25 in paper copy, $2.25 in microfiche. November 7, 1973. 126 p, 31 tab, 5 map.

Descriptors: *Texas, *Dam construction, *Multiple-purpose projects, *Reservoir construction, *Flood control, Environmental effects, Recreation, Water supply, Water resources development, Water supply development, Conservation, Wildlife conservation, Fish conservation,

Federal government, Economics, Regional development, Lakes.
Identifiers: *Environmental impact statements, Forth Worth(Tex), Dallas(Tex), Dam effects, Open space preservation.

This project calls for the construction of Lakeview Dam on Mountain Creek, approximately 10 miles southwest of Dallas, Texas, and the creation of Lakeview Lake, in order to provide flood control, water supply, recreation, and fish and wildlife conservation for the Fort Worth-Dallas metropolitan area. Approximately 10 miles of Mountain and Walnut Creeks will be inundated, as will 7500 acres of moderately productive agricultural land. Extensive land use changes around the lake can be expected and there will be social imposition and possible economic loss to individuals forced to relocate. In all the project will entail the acquisition and subsequent change in land-use of about 17,600 acres. Marginal fish and wildlife habitat will be inundated and income presently derived from lands to be flooded will be permanently lost. The proposed project is considered the most feasible among the various water supply and flood control alternatives considered. The enhancement of long-term productivity is deemed to greatly offset any benefits to be derived from present short-term uses of the land. The land to be inundated, which includes some known archaeological sites will be irretrievably committed to the project. (Deckert-Florida)
W75-08028

SOUTH FORK WATERSHED, PAWNEE AND RICHARDSON COUNTIES, NEBRASKA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
Available from the National Information Service, Springfield, Va 22161 as USDC, EIS-NB-73-1802-F, $4.25 in paper copy, $2.25 in microfiche. November 14, 1973. 70 p.

Descriptors: *Nebraska, *Reservoir construction, *Watershed management, *Multiple-purpose projects, *Flood control, Environmental effects, Recreation, Land management, Erosion control, Land use, Economics, Soil stabilization, Flood protection, Engineering structures, Habitat improvement, Flood plain zoning, Area redevelopment.
Identifiers: Dam effects, *Environmental impact statements, Pawnee County(Neb), Richardson County(Neb).

This project, located in southern Nebraska, proposes conservation land treatment measures within the watershed supplemented by 14 grade stabilization structures. Also included are two floodwater retarding structures, a multiple-purpose reservoir, and recreational facilities. The project is to be carried out by the Nemaha Natural Resources District with federal assistance under Public Law 566. Besides reducing erosion and sediment damage, the project will provide flood control and reduce flood damage to over 2000 acres of agricultural land. Water based recreation will also be provided. The project will eliminate agricultural use of 425 acres, temporarily eliminate wildlife use of 33 acres during construction, and convert 311 acres from private agricultural land to publicly owned land for recreational use. Alternatives considered were land treatment measures alone, flood plain zoning and public purchase, present plan without land and water for public use, and no action. The project will greatly enhance the long-term economic development of the region. Approximately 175 acres of land will be permanently inundated, and another 170 acres will be subject to occasional flooding. (Deckert-Florida)
W75-08029

NAWILIWILI SMALL BOAT HARBOR, KAUAI, HAWAII (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-HI-73-0753-F, $3.75 in paper copy, $2.25 in microfiche. March 29, 1973. 41 p, 2 tab, 3 map.

Descriptors: *Harbors, *Hawaii, Boating, *Marinas, Navigation, Environmental effects, Dikes, Breakwaters, Barriers, Recreation facilities, Aquatic habitats, Intertidal areas, Wetlands, Crabs, Dredging.
Identifiers: *Environmental impact statements, *Nawiliwili Bay(Hawaii).

Creation of a small boat harbor in the inner Nawiliwili Bay on the Island of Kauai, Hawaii, will require construction of a breakwater, revetted tide, stub breakwater, and navigational channel. Such action will result in the dredging of 71,000 cubic yards of spoil and the conversion of 18.4 acres of tidal flat areas to harbor structures and deeper water. A commercial harbor is located in the central portion of the Bay, the principle such facility on Kauai. The small boat harbor will eliminate the hazard to smallcraft from the surge action and backwash of deepdraft vessels, as well as providing needed mooring and launching facilities. Adverse environmental effects include an increase in turbidity, during construction, which will be minimized through dredging techniques and settling basin provisions. In addition, the project has been designed so that floating debris, oil and fuel spills connected with boating activity will float by action of the prevailing winds, against the dike for easy removal. Reduction of the tidal flat area should have no significant effect on the extent of local flooding. However, the flats presently provide habitat for crab species which will experience only limited recovery from the effects of the dredging. This destruction of marine habitat is unavoidable. Study has shown alternative plans untenable, and the present project will provide an urgently needed harbor for light-draft vessels and long term benefits to recreational boating and fishing and commercial fishing. (Ostapoff-Florida)
W75-08031

ARKANSAS RIVER AND TRIBUTARIES ABOVE JOHN MARTIN DAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Albuquerque, N.Mex.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-CO-73-1376-F, $5.75 in paper copy, $2.25 in microfiche. August 20, 1973. 140 p, 2 tab, 3 fig.

Descriptors: *Flood protection, *Flood control, *Dam construction, Fish, Wildlife, Levees, *Colorado, Flooding, Floods, Dams, Dam design, Lakes, Environmental effects, Floodwaters, Eutrophication, Reservoirs, Tributaries, Streams, Channels.
Identifiers: *Environmental impact statements, *Arkansas River Floodway(Colo), *Fountain Dam and Lake(Colo).

The project consists of a general investigation study comprised of four major aspects: (1) the Arkansas River Floodway, Colorado; (2) additional local flood protection projects; (3) construction of Fountain Dam and Lake; and (4) a restudy of the Arkansas River prior to authorization, considering all appropriate structural and non-structural alternatives for flood control and allied purposes and the environmental impact of such alternatives. The floodway will provide flood protection to 49 urban areas, 930 cultivated acres, and 121 transportation areas. 1090 acres of irrigated land will also be drained with resulting damage to the habitat of fish and wildlife. Additionally, land between the levees will provide greenbelt. Adverse environmental effects of the total project will entail detriment to fish and wildlife, detractions from scenic qualities, and a possibility of excessive eutrophication of Fountain Lake. The following alternatives were considered: single and multiple-purpose reservoirs on the main stream and tributaries; alteration of stream channels to increase flood carrying capacity; diversions, intercepting channels, levees, and floodwalls; bank protection works; combinations of the foregoing; and management of flood prone areas and resettlement. (Gagliardi-Florida)
W75-08033

SPRING BROOK WATERSHED, LANGLADE AND MARATHON COUNTIES, WISCONSIN (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4A.
W75-08035

MAINTENANCE DREDGING, BRONX RIVER, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer Districts, New York.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-NY-73-1349-F, $8.50 in paper copy, $2.25 in microfiche. August 15, 1973. 34 p, 1 map, 3 tab.

Descriptors: *Navigation, *Dredging, *New York, *Wildlife habitats, Environmental efaects, Water pollution, Waste disposal, Channels, Channel improvement, Landfills, Oceans, Commercial fishing.
Identifiers: *Environmental impact statements, *Bronx River(NY), New York Bight, Ocean dumping, Bronx County(NY).

The Bronx River, running a highly urbanized section of Bronx County, New York requires maintenance dredging of the federal channel and turning basin to the authorized project dimensions. This area is highly polluted, offering only nominal wildlife habitat, but to minimize the impact on fish, dredging will be scheduled during the winter months. Disposal of 83,000 cubic yards of spoil has been planned in the New York Bight. Past dumping has resulted in severe depreciation of environmental quality of the Bight, which has recovered only slowly. An alternate disposal site may exist at Coven Point in Jersey City, New Jersey, where a large industrial development is being planned, requiring land fill. The Corps of Engineers will continue investigation of this alternative, which will minimize the adverse environmental effects of ocean disposal. Abandonment of the navigation project would deprive the area of industry access by water requiring use of rail and trucks which would increase the level of noise and air pollution. (Ostapoff-Florida)
W75-08037

BIG RUNNING WATER DITCH WATERSHED PROJECT, LAWRENCE AND RANDOLPH COUNTIES, ARKANSAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Little Rock, Ark.
For primary bibliographic entry see Field 4D.
W75-08039

HANNIBAL LOCKS AND DAM, OHIO RIVER, OHIO AND WEST VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-OH-73-1142-F, $4.75 in paper copy, $2.25 in microfiche. July 1973. 80 p, 4 map, 5 fig, 1 tab.

Descriptors: *Locks, *Dam construction, *Dams, Navigation, Navigable rivers, *Ohio River, Ohio, West Virginia, Rivers, Dredging, Channeling, Channels, Environmental effects, Oxygen, Recreation, Turbidity, Sedimentation.
Identifiers: *Environmental impact statements, *Hannibal Locks and Dams(Ohio-WVa).

The project's purpose is to replace the badly deteriorated Hannibal Locks and Dams, and bring this branch of the Ohio River, in Ohio and West

Virginia, into conformity with the modernization program for the river's navigational system. Such improvements involve the construction and operation of a high lift, non-navigable gated dam with two parallel lock chambers; removal of three existing locks and dams; localized dredging to provide required channel clearances; and the establishment of public use and access areas. Environmental impacts of the action include inundation of approximately 1200 acres of river bank area and clearing of a total of 1,450 acres inundated by, or in close proximity to the new pool; alteration of the regimen of short in-flow reaches of the tributary streams resulting in change of biotic habitat; possible modification of dissolved oxygen content in some reaches of the river; and improved access to the river by recreationists. Adverse environmental effects entail inundation of land along the river banks and loss of plant life within the affected areas and temporary increases in turbidity and sedimentation during construction. The following alternatives were considered: no action, location of replacement structures at a different site, or changes in pool levels. (Gagliardi-Florida)
W75-08040

MARKLAND LOCKS AND DAM HIGHWAY BRIDGE AND APPROACHES, KENTUCKY AND INDIANA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Louisville, Ky.
For primary bibliographic entry see Field 4C.
W75-08041

CONSTRUCTION OF WASTEWATER FACILITIES, FORT WORTH, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Office of Grants Coordination.
For primary bibliographic entry see Field 5D.
W75-08042

CHANNEL EXTENSION, SIUSLAW RIVER AND BAR, LANE COUNTY, OREGON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Portland, Oreg.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-OR-74-0104-F, $5.75 in paper copy, $2.25 in microfiche. January 21, 1974. 127 p, 2 photo, 8 tab.

Descriptors: *Dredging, *Navigable rivers, *Channels, Basins, Rivers, *Oregon, Transportation, Channeling, Spoil banks, Forests, Shoals, Navigation, Water quality, Environmental effects, Pollutants.
Identifiers: *Environmental impact statements, Cushman(Ore), Mapleton(Ore).

The proposed action entails dredging two shoals of a navigation channel extension to widen the bends and create a turning basin, and dredging river bottoms to yield 110,000 cubic yards of spoil, with accompanying maintenance dredging. The project will improve navigation between Cushman and Mapleton, Oregon, resulting in savings in transportation costs. In addition, the competitive position of the local forest products industry will be improved and possibly also the water quality and bottom condition will be enhanced. Adverse environmental effects include a reduction in biological productivity of aquatic and upland environments disturbed by dredging and by disposition of dredged materials, possible land use changes associated with elevation of disposal areas, temporary discoloration of river water and deposition of dredged material on the land, and possible bottom disturbance and potential pollution due to use of larger commercial vessels. Alternatives considered include provision of a deeper channel, greater reliance on land modes of transportation, different locations for disposal of dredged materials, construction and maintenance of a 12-foot-deep channel by private interests, or no action. (Gagliardi-Florida)
W75-08043

NAVIGATION SEASON EXTENSION DEMONSTRATION PROGRAM (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Detroit, Mich.
For primary bibliographic entry see Field 4A.
W75-08044

RED RIVER WATERWAY, LOUISIANA, TEXAS ARKANSAS, AND OKLAHOMA, AND RELATED PROJECTS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-LA-73-0800-F, $8.50 in paper copy, $2.25 in microfiche. April 2, 1973. 260 p, 19 map, 8 fig.

Descriptors: *Channel improvement, *Bank stabilization, *Flood protection, Surface waters, Recreation facilities, Flood damage, Locks, Dams, Dam design, Banks, Texas, Construction, Navigation, Mississippi River, Channels, Dam sites, Louisiana, Arkansas, Recreation, Floods, Flood control, Environmental effects, Forests, Agriculture, Wildlife, Turbidity.
Identifiers: *Environmental impact statements, *Shreveport(La), *Daingerfield(Tex), *Index(Ark).

The proposed project involves the construction and maintenance of the Red River Waterway project, which consists of a navigation channel, with five locks and dams and related bank stabilization from the Mississippi River to Shreveport, Louisiana, and continuation of a navigation channel from Shreveport to Daingerfield, Texas, utilizing four locks and dams. In addition, the water project incorporates a bank stabilization feature between Shreveport and Index, Arkansas, which provides for channel realignment and bank stabilization works where necessary. The development of recreational facilities is included as a co-feature to both navigation and bank stabilization. The projects will halt the continuing loss, concommitant to the meandering of the Red River, of valuable lands and improvements located thereon. Flood damages will be reduced, the security and integrity of existing flood protection works will be increased, and the availability of surface water will be enhanced. The following adverse environmental effects are unavoidable: dedication of agricultural and forest lands to project purposes; modification or alteration of existing resources or land areas to be committed to project purposes; changes in ground water levels adjacent to slack water pools; loss of wildlife habitats; introduction and increases in turbidity; modification of water bottoms; and modification of aesthetic attributes. (Gagliardi-Florida)
W75-08045

NEW ROCHELLE AND ECHO BAY HARBORS, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-NY-73-1780-F, $3.75 in paper copy, $2.25 in microfiche. November 12, 1973. 32 p, 1 map, 1 fig, 1 tab.

Descriptors: *New York, Federal government, *Environmental effects, *Dredging, *Harbors, Navigable waters, Non-consumptive use, disposal, Water resources development, Recreation, Bays, Recreation facilities, Navigation, Boating, Channel improvement.
Identifiers: New Rochelle(NY), *Echo Bay Harbor(NY), *Environmental impact statements, Spoil disposal.

This project consists of construction of a 34.8 acre anchorage area and access channel in Echo Bay Harbor in New Rochelle, New York. The minimum depth in the anchorage area will vary between 6 and 7 feet and the access channel will measure 6 feet deep and 100 feet wide for a distance of 0.11 mile. The spoil from this project will probably be disposed of in the approved dumping grounds in the nearby New York Bight, although alternative disposal methods are available. The area surrounding Echo Bay is generally urban in character and the harbor primarily recreational. This project will enhance the long-term value of the bay as a recreational boating resource. A temporary increase in turbidity during dredging is expected, but the impact, if any, on fish life should be localized and of shor duration. Alternative plans considered included a smaller anchorage area, no action, and alternative spoil disposal methods. The purpose action would not have any significant impact on the aquatic uses of the harbor by existing marine life, and it would preserve the productivity of the harbor as a recreational resource. Ocean disposal of the spoil would have a long-term detrimental effect on the biological productivity of the disposal site. Comments were received from various government agencies, but there is no known opposition to this project. (Deckert-Florida)
W75-08046

UPPER THOMPSON SANITATION DISTRICT, ESTES PARK, COLORADO PROJECT NO. C0803222 (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Denver, Colo. Region VIII.
For primary bibliographic entry see Field 5D.
W75-08047

DIKED DISPOSAL AREA, HURON HARBOR, ERIE COUNTY, HURON, OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Buffalo, NY.
For primary bibliographic entry see Field 5G.
W75-08048

RICHMOND INNER HARBOR, MAINTENANCE DREDGING, CONTRA COSTA COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 5G.
W75-08049

AUTHORIZED GRANITE REEF AQUEDUCT, CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo.
Available from the National Technical Information Center, Springfield, Va. 22161, as EIS-AZ-74-0124-F, $12.50 in paper copy, $2.25 in microfiche. January 22, 1974. 548 p, 72 fig, 9 tab.

Descriptors: *Aqueducts, *Colorado River, *Pumping plants, Environmental effects, Environment, *Arizona, Water, Pumping canals, Reefs, Siphons, Tunnels, Biota, Migration, Migration patterns.
Identifiers: *Environmental impact statements, *Phoenix(Ariz).

The project involves the construction of an aqueduct to convey Colorado River water from the Havasu diversion facilities at Lake Havasu, Yuma County, to the bifurcation works at the start of the Salt-Gila Aqueduct near Phoenix, Maricopa County, Arizona. The water will enter the aqueduct at the outlet portal of the Buckskin Mountains Tunnel, be raised 388 feet in the aqueduct by a series of pumping plants, and then conveyed by an open concrete-lined canal, siphons and tunnels for approximately 183 miles. The action will result in a long-term average of 1.1 million acre-feet of water pumped annually from Lake Havasu and conveyed through the aqueduct to the service area in central Arizona for multiple-purpose uses. The adverse environmental effects

of the project include alteration of the environment within the alinement route of the Granite Reef Aqueduct; damage to the aesthetic value of the immediate area due to construction of the pumping plants and the canal; disturbance of biota in the area; alteration of migration patterns of certain species of animals; and animal losses due to drowning. The following proposals were also considered: alternative water sources; alternative power sources; alternatives to the selected route of the Granite Reef Aqueduct; and no action. (Gagliardi-Florida)
W75-08050

PERILLA MOUNTAIN WATERSHED PROJECT, COCHISE COUNTY, ARIZONA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W75-08051

KAIMU BEACH HAWAII, PROPOSED SHORE PROTECTION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Corps of Engineers, Honolulu, Hawaii. Pacific Ocean Div.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-HI-74-0188-F, $5.75 in paper copy, $2.25 in microfiche. January 31, 1974. 134 p, 5 plate, 3 tab, 1 append.

Descriptors: *Shore protection, *Excavation, *Sands, *Breakwaters, Beach erosion, Beaches, Surf-boarding, Benthic fauna, Benthic flora, Shores, Structures, Structural design, National seashores, *Hawaii.
Identifiers: Black sand, *Environmental impact statements, Kaimu Beach(Hawaii).

The Kaimu Beach Shore Protection Plan provides for excavation and stockpiling of about 5800 cubic yards of black sand from Kaimu Beach and placement of approximately 38,000 cubic yards of new sand, followed by a two year monitoring program. Included in the plan are construction of a submerged breakwater, placement of about 10,800 cubic yards of beach sand and topping of the beach with the 5800 cubic yards of stockpiled black sand. The sand placement will result in a widened and restored beach, and the breakwater will reduce erosion of the natural black sand. The breakwater will add a permanent man-made element to the natural environment and disrupt waves presently suitable for surfing. The project will also disturb some benthic life. Alternatives considered consists of various structural alternatives or no action. (Denvir-Florida)
W75-08052

VIRGINIA KEY BEACH EROSION CONTROL PROJECT, SECOND PERIODIC NOURISHMENT AND GROINS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Jacksonville, Fla.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-FL-73-1952-F, $4.25 in paper copy, $2.25 in microfiche. December 17, 1973. 65 p, 6 plate, 4 chart.

Descriptors: *Erosion control, *Beach erosion, *Berms, *Groins(Structures), Benthic fauna, Benthic flora, Vegetation regrowth, Vegetation, Erosion, Beaches, Vegetation establishment, Invertebrates, Sands, Water quality, Borrow pits, Construction, Structures, Environmental effects, *Florida.
Identifiers: *Environmental impact statements, *Virginia Key(Fla).

The Virginia Key Beach Erosion Control Project consists of excavation and placement of 100,000 cubic yards of sand on 1.8 miles of Virginia Key ocean shore and construction of 1 impermeable and 12 permeable groins. Implementation will create 70 feet of level beach berm. Some vegetation, benthic organisms, and invertebrates will be destroyed during excavation and construction, but should reestablish on suitable portions of the beach, and will assist in preventing erosion. Dredging and distributing sand fill will temporarily degrade water quality at the borrow and beach fill sites. The groins will cover some bottom habitats and change to some extent the composition of species in the area. Consideration was given to alternate borrow sites, varying number of groins and construction of other structures. The plan selected was assessed as the most beneficial entailing the least environmental costs. (Denvir-Florida)
W75-08053

LAKE QUINAULT SEWAGE COLLECTION AND TREATMENT FACILITY, OLYMPIC NATIONAL FOREST, OLYMPIA, WASHINGTON (FINAL ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 5D.
W75-08054

HIGHWAY 112 CRITICAL EROSION CONTROL RESOURCES CONSERVATION AND DEVELOPMENT PROJECT MEASURE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Madison, Wis.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-WI-73-2013-F, $4.25 in paper copy, $2.25 in microfiche. December 26, 1973. 54 p, 3 fig, 6 photo.

Descriptors: *Erosion control, *Erosion, *Gully erosion, *Gullies, Slope protection, Grading, Mulching, Seed treatment, Tiles, Sediments, Sedimentation, Vegetation establishment, Surface runoff, Surface waters, *Wisconsin.
Identifiers: *Environmental impact statements, *White River(Wis).

The project is aimed at controlling erosion in a gully in White River, Wisconsin by means of sod waterways, sloping, grading, seeding, mulching, and tiling. Implementation will control the rate of erosion from a single site as well as decrease the volume of sediment being deposited in the White River. The project will change the type of vegetative cover in the area and increase the exposure of unprotected soil until the new vegetation becomes established. Alternatives such as installation of a closed conduit, diversion of surface runoff to another watercourse, or diversion to the White River via three watercourses were considered. (Denvir-Florida)
W75-08055

CHANNEL TO NEWPORT NEWS, VIRGINIA (MAINTENANCE DREDGING) (ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Norfolk, Va.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-VA-73-1871-F, $3.75 in paper copy, $2.25 in microfiche. November 28, 1973. 40 p, 2 fig, 3 tab.

Descriptors: *Dredging, *Channels, Turbidity, Harbors, Shoals, Neritic, Environmental effects, *Virginia, Navigation, Oysters, Channeling, Channel improvement, Clams, Benthic fauna, Benthic flora.
Identifiers: *Environmental impact statements, Newport News(Va).

The project involves dredging required to maintain the 800-foot wide channel to Newport News, Virginia at the project depth of 45 feet. This channel extends westwardly approximately 4.8 miles from Norfolk Harbor Channel to the Chesapeake and Ohio Railway Company coal piers. Maintenance dredging will require removal of about 300,000 cubic yards of shoal material over the entire channel length while maintaining the carrying capacity of the channel for efficient movement of commercial navigation. The action will remove or disrupt some neritic and benthic organisms and will result in a temporary increase in turbidity near the dredge area. The environment will be adversely affected by removal or disturbance of resident benthic organisms such as oysters and clams and will result in the temporary increase in turbidity. The only alternative considered was to forego further maintenance. (Gagliardi-Florida)
W75-08057

INDIAN CREEK WATERSHED PROJECT, CITY OF CHESAPEAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Richmond, Va.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-VA-74-00016-F, $4.25 in paper copy, $2.25 in microfiche. January 2, 1974. 67 p, 2 map, 6 tab, 3 append.

Descriptors: *Watershed management, *Flood protection, *Drainage, *Watershed Protect. and Flood Prev. Act, Turbidity, Vegetation, Flooding, Floods, *Virginia, Channels, Water, Pastures, Crops, Mosquitoes, Flood control.
Identifiers: *Environmental impact statements, Chesapeake(Va), Indian Creek watershed(Va).

The project entails watershed protection, flood prevention and drainage in Chesapeake, Virginia, to be implemented under authority of the Watershed Protection and Flood Prevention Act, as amended. The proposed action will reduce net crop and pasture damage by about 25 percent with a resulting improvement in crop quality. Additionally, the removal of excess water through adequate outlets for farm drainage systems will reduce mosquito breeding areas and provide benefits to 2,375 acres on 40 farms now in cropland and pasture. Farm operators will be able to use the modern production methods needed to maintain their competitive marketing position. Planned construction will disturb about 17 acres on 8 farms which will create turbidity for a few weeks during construction and prior to vegetation cover being established. The following alternatives were considered: land treatment and additional channel work, acquisition of land, and no action. (Gagliardi-Florida)
W75-08058

EAGLE-TUMBLEWEED DRAW WATERSHED, EDDY AND CHAVES COUNTIES, NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W75-08060

MISSOURI RIVER GARRISON DAM TO LAKE OAHE RESERVOIR (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Omaha, Nebr.
Available from National Technical Information Service, USDC, Springfield, Va 22161 as EIS-NB-73-1866-F, $4.25 in paper copy, $2.25 in microfiche. November 28, 1973. 70 p, 6 plate; append.

Descriptors: *Bank protection, *Bank erosion, *Erosion control, *Trenches, Dikes, Aesthetics, Flood plains, Flood protection, Flooding, Erosion, Habitats, Wildlife habitats, *North Dakota, *Missouri River.
Identifiers: *Environmental impact statements, Dry Point(ND), *Bismark(ND).

The 88th and 90th Congress authorized the Corps of Engineers to provide for bank protection or rectification works on the Missouri River at or below Garrison Dam as may be found necessary. To data erosion control measures have been taken

at various points by means of trench revetments, stonefill revetments, windrow stonefill revetments and stonefill dikes. Erosion protection measures are presently being undertaken in the Dry Point area, 10 miles north of Bismark, North Dakota, which include construction of various sorts of revetments and stonefill dikes. The present project contemplates similar measures along the stretch of the River in Mener, Oliver, Morton, Busleigh and McLean Counties, North Dakota. Implementation will provide protection for 14,700 acres of agricultural land. The project in addition to lessening the aesthetic values associated with natural flood plains will have the effect of diminishing to some extent the wildlife habitat in the affected areas. The only alternative to the proposed action is to forego implementation of the project altogether. (Denvir-Florida)
W75-08061

PAINT CREEK WATERSHED, HARPER COUNTY, OKLAHOMA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Stillwater, Okla.
For primary bibliographic entry see Field 4D.
W75-08062

COST SHARING AS AN INCENTIVE TO ATTAIN THE OBJECTIVE OF SHORELINE PROTECTION,
National Bureau of Standards, Washington, D.C. Inst. for Applied Technology.
For primary bibliographic entry see Field 6C.
W75-08185

PLANNING THE TEHACHAPI CROSSING,
Burns and Roe, Inc., Sacramento, Calif.
For primary bibliographic entry see Field 6A.
W75-08201

MONETARY VALUES OF LIFE AND HEALTH,
Tennessee Valley Authority, Knoxville. Flood Control Branch.
For primary bibliographic entry see Field 4A.
W75-08202

CHARACTERIZATION OF OPTIMAL OPERATING POLICIES FOR FINITE DAMS,
California Univ., Los Angeles. Dept. of Systems Engineering.
For primary bibliographic entry see Field 4A.
W75-08223

8B. Hydraulics

SEISMIC RESPONSE OF RESERVOIR-DAM SYSTEMS,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
E. B. Wylie.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 101, No HY3, Proceedings Paper 11184, p 403-419, March 1975. 14 fig, 17 ref, 4 append. NSF Grants GI-34771, GK-14213.

Descriptors: *Dams, *Numerical analysis, *Seismic design, *Mathematical models, Earthquakes, Reservoirs, Analysis, Hydrodynamics, Compressibility, Equations, Dynamics.
Identifiers: *Dynamic response.

A numerical method was developed to model the transient response of a reservoir to vertical or horizontal boundary displacements. The reservoir was represented by a latticework of line elements and the motion in the continuum was modeled by solving the one-dimensional transient flow equations in the elements. The two-dimensional behavior was computed by combining motions of one-dimensional elements interconnected at the lattice nodes. The latticework model was calibrated to assure accurate predictions of the transient response. Comparisons with exact solutions of the two-dimensional hydrodynamic problem were presented for a step function input and for actual earthquake excitations. The temporal variation of hydrodynamics forces were computed on a vertical faced dam in a confined reservoir and in a semi-infinite reservoir. The interaction between a flexible tapered concrete gravity dam, which was modeled as a shear-beam, and a confined reservoir was studied. (Adams-ISWS)
W75-07930

COMPUTATION OF STAGE-DISCHARGE RELATIONSHIPS AFFECTED BY UNSTEADY FLOW,
National Weather Service, Silver Spring, Md. Hydrologic Research and Development Lab.
For primary bibliographic entry see Field 2E.
W75-07932

NONLINEAR KINEMATIC WAVE APPROXIMATION FOR WATER ROUTING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W75-07935

OPTIMAL COST DESIGN OF BRANCHED SEWER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W75-07999

POTENTIAL LANDSLIDE-GENERATED WATER WAVES, LIBBY DAM AND LAKE KOOCANUSA, MONTANA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. D. Davidson, and R. W. Whalin.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-15, December 1974. 102 p, 2 fig, 3 tab, 6 photo, 51 pl, 4 append, 7 ref.

Descriptors: *Hydraulic models, *Landslides, *Waves(Water), *Montana.
Identifiers: *Lake Koocanusa(Mont), *Libby Dam(Mont).

A hydraulic model, constructed at an undistorted scale of 1:120, reproduced about 1 mile upstream of the dam and about 1200 ft downstream of the dam for the purpose of determining the magnitude of wave heights, runup, and over-topping of the dam for four potential landslides. The model landslide material primarily consisted of 1/18-cu-ft bags of iron ore and lead mixed to reproduce the correct rock mass density. These bags were hand-stacked up the inclined plane slope to obtain the correct elevation-volume-shape relationship, held in place mechanically, and then released to slide into the model under the influence of gravity. A few tests also were conducted with gravel and concrete cubes as the landslide material for comparison with the results of the bag tests. Results of the model study showed the wave amplitudes, runup, and downstream water expected at various reservoir pool elevations as a function of landslide parameters. Two important conclusions were that: (a) full volume landslides caused unacceptable conditions at the dam for pool elevations tested, depending on the landslide velocity; and (b) partial landslide failure (both upper and lower portions) also generated unacceptable conditions at the dam. (WES)
W75-08291

PRACTICAL GUIDANCE FOR DESIGN OF LINED CHANNEL EXPANSIONS AT CULVERT OUTLETS; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-9, October 1974. 90 p, 38 fig, 3 tab, 8 pl, 8 photo, 2 append, 14 ref.

Descriptors: *Culverts, *Discharge(Water), *Scour, Froude number, Open channel flow, Design.
Identifiers: *Channel lining, *Channel expansion, Tailwater elevation.

Detailed results are presented of research conducted to develop practical guidance for design of lined channel expansions at culvert outlets. Results of related research efforts during the past decade to develop practical guidance for estimating and controlling erosion downstream of culvert and storm-drain outlets are summarized. Empirical equations and charts are presented for estimating the extent of localized scour to be anticipated downstream of culvert and storm-drain outlets the size and extent of various natural and artificial type revetments and energy dissipators that may be used to control localized scour. With these results, designers can estimate the extent of scour to be expected and select appropriate and alternative schemes of protection for controlling erosion downstream of culvert and stormdrain outlets. (WES)
W75-08292

RICHARD B. RUSSELL LAKE WATER QUALITY INVESTIGATION; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
D. G. Fontane, and J. P. Bohan.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-14, December 1974. 51 p, 25 pl, 5 ref.

Descriptors: *Mathematical models, *Model studies, Reservoirs, *Water quality, *Hydraulic models, Lakes, *Georgia, Oxygen, Thermal pollution, Path of pollutants.
Identifiers: Oxygen regimes, *Richard B. Russell Lake(Ga).

The thermal and dissolved oxygen regimes of the proposed Trotters Shoals (Richard B. Russell) Reservoir were simulated using a combination of physical and mathematical models. The effects of the Trotters Shoals Reservoir upon the thermal and dissolved oxygen regimes of a downstream impoundment, Clark Hill, were also evaluated. Both conventional power generation and pumped-storage power operations at Trotters Shoals Reservoir were studied. Three physical models were used to describe the expected hydrodynamics in Trotters Shoals and Clark Hill Reservoirs. The withdrawal characteristics of the intakes and the entrainment, dilution, placement, and travel time of the inflow and pumpback density currents were determined. The results of the physical model tests were incorporated into a mathematical model capable of simulating the physical and chemical characteristics of an impoundment. This mathematical model was further modified to include a routine to predict the dissolved oxygen structure of an impoundment. The mathematical model was calibrated with observed thermal and dissolved oxygen data on the existing Hartwell and Clark Hill impoundments, which are immediately upstream and downstream, respectively, of the proposed Trotters Shoals Reservoir. The model was then used to simulate the thermal and dissolved oxygen regimes of Trotters Shoals Reservoir. (WES)
W75-08293

TILLAMOOK BAY MODEL STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. M. Fisackerly.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-11, November 1974. 22 p, 8 fig, 1 tab, 6 photo, 117 pl, 2 append.

Descriptors: *Hydraulic models, Salinity, Tides, Flow, *Shoals, *Jetties, Estuaries, *Oregon, *Saline water intrusion, Bays.
Identifiers: *Tidal currents, *Tillamook Bay(Ore).

The Tillamook Bay model was of the fixed-bed type, constructed to scales of 1:500 horizontally and 1:100 vertically, and reporduced Tillamook Bay, Oregon, in its entirety and a suitable area of the Pacific Ocean. The model was equipped for accurate reporduction and measurement of tides, tidal currents, salinity intrusion, freshwater inflow, shoaling distribution, and other significant prototype phenomena. The purpose of the model study was to determine the optimum alignment and length of south jetty at the entrance to Tillamook Bay. Model verification tests indicated that the model hydraulic and salinity regimens were in satisfactory agreement with those of the prototype for comparable conditions. It therefore can be assumed that the model provided quantitative answers concerning the effect of the proposed plans on the hydraulic and salinity regimens of the bay. The optimum plan consisted of existing conditions plus a 7000-ft south jetty located 1200 ft from the north jetty. Lengths greater than this do not modify the shoaling pattern to an great degree and should be considered only if additional protection for navigation is required. (WES)
W75-08294

UNSTEADY FLOW COMPUTATIONS ON THE OHIO-CUMBERLAND-TENNESSEE-MISSISSIPPI RIVER SYSTEM,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. H. Johnson.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-8, September 1974. 44 p, 2 fig, 2 tab, 11 pl, 3 append.

Descriptors: *Flood control, *Mathematical models, *Mississippi River, *Ohio River, *Tennessee River, *Unsteady flow.
Identifiers: *Cumberland River, Barkley Reservoir, Kentucky Reservoir.

The U.S. Army Engineer Division, Ohio River, directs the operation of Barkley and Kentucky Reservoirs on the Cumerland and Tennessee Rivers, respectively, during periods of flooding on the lower Ohio and lower Mississippi Rivers. Flood control regulation by these reservoirs is met by controlling, to some degree, the Ohio River stage at Cairo, Illinois. A mathematical model, SOCHMJ, capable of accurately preidcting Ohio River stages as a result of reservoir operations at Barkley and Kentucky Reservoirs has been developed. SOCHMJ provides the capability of modeling a system containing an unlimited number of junctions. The physical limits of the Ohio-Cumberland-Tennessee-Mississippi system modeled are Golconda, Illinois, on the Ohio River; Barkley Dam on the Cumberland River; Kentucky Dam on the Tennessee River; Cape Girardeau on the upper Mississippi River; and Caruthersville on the lower Mississippi River. Three applications of SOCHMJ were made in the study. These were (a) an application using 1950 flood data, (b) an application using 1973 flood data, and (c) an application using data from a 3-day period in February 1974. (WES)
W75-08295

SPILLWAY FOR COLUMBUS LOCK AND DAM TOMBIGBEE RIVER, ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt, and G. A. Pickering.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-13, November 1974. 29 p, 5 fig, 1 tab, 5 photo, 7 pl.

Descriptors: *Hydraulic models, *Open channel flow, *Riprap, *Spillways, *Stilling basins, Flow, *Alabama.
Identifiers: Columbus Lock and Dam(Ala), *Tombigbee River(Ala).

Tests were conducted on a 1:36-scale model of the Columbus Lock and Dam spillway to determine discharge characteristics of the spillway, stilling basin performance, and riprap requirements downstream from the structure for both normal and single-gate operations. The proposed spillway will consist of five 60-ft-wide bays through which flow will be regulated by tainter gates. An unsteady flow condition was detected with gated flows when a trench to be excavated during construction was left more than 10 ft lower than the crest of the spillway. Therefore, it is recommended that this area be filled to at least el 128. The stilling basin as originally designed resulted in satisfactory performance during normal operation. However, with only one gate one-half or fully open, performance of the basin was unsatisfactory. Several modifications to the basin were tested in an effort to improve energy dissipation and a stilling basin that provided satisfactory flow conditions was developed. Tests to determine the riprap requirements in the exit channel indicated that the coverage of protection needed was the same whether the gate was one-half or fully open. (WES)
W75-08296

SPILLWAY FOR ALICEVILLE LOCK AND DAM TOMBIGBEE RIVER, ALABAMA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
N. R. Oswalt.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-10, October 1974. 35 p, 7 fig, 7 photo, 8 plates.

Descriptors: Energy dissipation, *Hydraulic models, *Open channel flow, *Riprap, *Spillways, *Stilling basins, *Alabama.
Identifiers: Aliceville Lock and Dam(Ala), *Tombigbee River(Ala).

Tests were conducted on a 1:36-scale model of the Aliceville spillway to develop an energy dissipator and plan of riprap that would provide adequate protection of the exit channel both for normal operating conditions and for the condition of one gate opened full with minimum tailwater conditions. A stilling basin was developed to provide satisfactory flow conditions for both normal and emergency operating conditions. The following changes from the original design were recommended: Eliminate a 90-deg end-section of the left stilling basin training wall, shorten the length of the right training wall between the gated and ungated spillways from 115 to 40 ft, reduce the original excavation requirements along the downstream right bank, and decrease the approach depth immediately upstream of the spillway. Tests to determine the minimum riprap requirements for the exit channel indicated the necessity to develop a plan of protection for about 600 ft downstream of the basin. To eliminate undesirable eddy patterns in the lower lock approach downstream of the spillway a vane dike was constructed, and the riprap requirements for stability of the dike were determined. (WES)
W75-08297

SAN DIEGO BAY MODEL STUDY; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
G. M. Fisackerly.
Available from the National Technical Information Service, Springfield, Va. 22161. Technical Report H-74-12, November 1974. 144 p, 10 fig, 4 tab, 6 photo, 113 pl.

Descriptors: *Hydraulic models, *Tides, *Estuaries, *California.
Identifiers: *San Diego Bay(Cal), Tidal currents.

The San Diego Bay model was a fixed-bed model constructed of concrete to scales of 1:500 horizontally and 1:100 vertically. The model was equipped for the accurate reproduction of tides, tidal currents, and other significant prototype phenomena. The purpose was to determine the effects of a second entrance into the bay on the hydraulic and flushing characteristics of the bay. Model verification tests indicated that hydraulic phenomena reproduced in the model were in satisfactory agreement with those of the prototype for comparable conditions. Tests were conducted with plans for two different second entrance locations near the south end of the bay installed in the model. Maximum current velocities throughout the northern half of the bay were generally reduced by about 70 percent by both plans. The results of dye tracer tests showed that both plans would appreciably improve the overall flushing characteristics of the bay, with the northermost second entrance producing the most improvement in flushing. With either second entrance in the model, the nodal point of the incoming tide was somewhat to the south of the nodal point of the outgoing tide, thus creating a circulation pattern with a net flow into the bay through the existing entrance and a net outflow through the proposed second entrance. (WES)
W75-08298

EFFECTS OF A STEADY NONUNIFORM CURRENT ON THE CHARACTERISTICS OF SURFACE GRAVITY WAVES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
L. Z. Hales, and J. B. Herbich.
Available from the National Technical Information Service, Springfield, Va. 22161. Miscellaneous Paper H-74-11, December 1974. 186 p, 64 fig, 13 tab, 34 ref, append.

Descriptors: *Gravity waves, *Waves(Water).
Identifiers: *Surface waves(Water), *Tidal currents, *Tidal inlets.

This study investigated the manner in which nonuniform currents affect characteristics of a superimposed surface gravity wave train. The work was conducted in a three-dimensional wave basin in which was simulated a tidal inlet through which could be created nonuniform currents in both an ebb and flood direction. Current was required to build up on its own accord from essentially zero velocity in the ocean, reach a maximum value in the inlet throat and decay to essentially zero velocity in the bay region, for the flood condition. The ebb condition was similar except the current opposed the direction of the wave motion. For a variety of steady-state flow conditions through the facility, a range of wave trains with initial characteristics representative of those found in nature were superimposed. Measurements of velocity, wave height, and wave length were determined at selected points along the axis of the facility. Spectral analyses of the generated wave form justified the assumption of constancy of the wave period; hence, theoretically the change in wave length was expected to vary with a current parameter in a linear fashion. Analysis indicated that in addition to the current parameter, the relative depth and initial wave steepness were statistically highly significant parameters affecting the changes in both wave length and wave height. (WES)
W75-08299

NECHES RIVER SALTWATER BARRIER,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
C. J. Huval.
Available from the National Technical Information Service, Springfield, Va. 22161. Miscellaneous Paper H-74-9, August 1974. 51 p, 12 fig, 10 tab, 6 ref.

Descriptors: *Saline water intrusion, *Saline water barriers, *Channel improvement, *Texas, Salinity, Withdrawal.
Identifiers: Salt water intrusion, *Neches River(Tex), Channel deepening.

A study of historical salinity data as a function of Federal channel deepening and freshwater withdrawals was conducted. On the basis of the data, a method of allocating relative effects on salinity intrusion of channel improvements and freshwater withdrawals was developed and applied to the Neches River. (WES)
W75-08301

8C. Hydraulic Machinery

OPTIMAL MONTHLY OPERATION OF INTERCONNECTED HYDROELECTRIC POWER STORAGES,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W75-07898

AUTHORIZED GRANITE REEF AQUEDUCT, CENTRAL ARIZONA PROJECT, ARIZONA-NEW MEXICO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Reclamation, Denver, Colo.
For primary bibliographic entry see Field 8A.
W75-08050

8D. Soil Mechanics

CONCENTRATION EFFECTS OF SETTLING-TUBE ANALYSIS,
Technische Hogeschool, Delft (Netherlands). Department of Civil Engineering.
For primary bibliographic entry see Field 2J.
W75-07949

MOVEMENT OF TWO NONIONIC SURFACTANTS IN WETTABLE AND WATER-REPELLENT SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W75-07984

DISTRIBUTION OF NONIONIC SURFACTANT IN SOIL COLUMNS FOLLOWING APPLICATION AND LEACHING,
California Univ., Riverside.
For primary bibliographic entry see Field 2G.
W75-07987

BLUE MARSH LAKE PROJECT, TULPEHOCKEN CREEK, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Philadelphia, Pa.
Available from the National Technical Information Service, Springfield, Va 22161 as USDC, EIS-PA-73-1333-F-S, $7.25 in paper copy, $2.25 in microfiche. August 3, 1973. 218 p, 40 tab, 9 map, 38 graph.

Descriptors: *Embankments, *Dikes, *Reservoir construction, *Channel improvement, Levees, Environmental effects, Reservoir sites, Flooding, Flood control, Rock fill, Spillways, Floods, Water supply, *Pennsylvania, Reservoir storage, Recreation, Turbidity, Reservoirs, Control structures, Wildlife, Landscaping, Channels, Outlet works, Water quality, Flood protection, Industrial water, Pollutants.
Identifiers: *Environmental impact statements, Berks County(Penn).

The proposed project, located on Tulpehocken Creek in Berks County, Pennsylvania, includes an earth and rockfill embankment and three nearby dikes to contain the reservoir during high pool levels. Also, an unlined open channel spillway will be excavated across a natural saddle approximately 1,000 feet south of the embankment. Outlet works and a levee will also be constructed. The proposed action will result in the following environmental effects: a decrease in potential damage from flooding; an increase in industrial and municipal water supply; increased recreation and wildlife potential; improvement of water quality; and increased turbidity of Tulpehocken Creek. The most important long-term adverse effect is the potential arsenic and biological pollution in the proposed reservoir. There are indications, however, that these concentrations can be controlled. Adverse aesthetic effects will hopefully be mitigated by restorative landscaping, intended to blend the project structures into the present environment. The following alternatives were considered: non-structural projects, such as flood plain management; a different locale for the project; and no action. (Gagliardi-Florida)
W75-08019

APPLICATION FOR PERMIT TO CONSTRUCT A DAM ON MURDERERS CREEK GREEN COUNTY, NEW YORK (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New York.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-NY-73-0835-F, $8.50 in paper copy, $2.25 in microfiche. December 7, 1972. 254 p, 20 tab, 3 graph, 4 fig, 10 map.

Descriptors: *Dam construction, *Recreation facilities, *Land use, Environmental effects, Impoundments, Dam design, Dams, Lakes, Forests, *New York, Hudson River, Recreation, Water quality, Eutrophication, Wildlife, Construction, Air, Turbidity, Erosion, Streams.
Identifiers: *Environmental impact statements, *Murderers Creek(NY).

The project entails construction of an earth fill dam on Murderers Creek, New York, just upstream of its confluence with tidewater of the Hudson River. The dam will create a 323 acre lake that would be the central feature of a recreational-residential development. The overall development will beneficially affect the local economy, land use, water quality and biological resources. Adverse environmental effects include removal of forestation, conversion of an open creek into an impoundment with the potential for eutrophication and an adverse effect on local wildlife. Construction activities would generate temporary noise and air pollution and accelerate erosion with resulting increases in turbidity and nutrient loads in the stream. The alternative to the proposed action is not to issue the permit for construction of the dam. The alternatives relevant to the overall development are building at another site, providing a series of small impoundments instead of a single large one, or varying the size of the dam and lake. (Gagliardi-Florida)
W75-08023

PROPOSED HABITAT ENHANCEMENT PROJECT TOPCOCK MARSH UNIT, HAVASU NATIONAL WILDLIFE REFUGE, ETC. (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
Available from the National Technical Information Service, Springfield, Va. 22161, as EIS-AZ-73-1643-F, $5.25 in paper copy, $2.25 in microfiche. October 15, 2973. 110p, 9 map, 1 fig.

Descriptors: *Dikes, *Water management(Applied), *Channels, *Water circulation, Habitats, Habitat improvements, *Arizona, Marshes, Channeling, Canals, Fishing, Fisheries, Fish, Wildlife, Canal construction, Levees, Sediments, Sedimentation, Silts, Turbidity.
Identifiers: *Environmental impact statements, Mohave County(Ariz), Wilderness areas.

The project, proposed by the Bureau of Sport Fisheries and Wildlife of the Department of Interior, involves habitat enhancement within the Topcock Marsh Unit of Havusu National Wildlife Refuge, Mohave County, Arizona. The proposed project would include diking to permit water management; channeling to improve water circulation; levees and management units to provide habitat for the endangered Yuma clapper rail; construction of a sediment basin to trap silt from the marsh inlet canal; and diking to isolate water from Fort Mohave Indian land. Adverse environmental effects entail a possible reduction in microorganisms, short-term disturbance of wildlife use during construction, and a short-term increase in local turbidity within the marsh during construction. The following alternatives were considered: continuation under the present management; increase of the water diversion to the marsh; development of a system of cross dikes to control water distribution; implementation only of the diking portion of the project; and further reduction of the size of the marsh. (Gagliardi-Florida)
W75-08038

8F. Concrete

SIXES BRIDGE DAM AND LAKE, MARYLAND AND PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
Available from National Technical Information Service, Springfield, Va 22161 as U.S.D.C. EIS-MD-73-1914-F. December 11, 1973. 229 p, 4 map, 4 photo, 24 tab, 1 graph.

Descriptors: *Water supply, *Stream improvement, *Dam construction, *Recreation, *Concrete dams, Maryland, Dams, Lakes, Wildlife, Flow, Flow profiles, Streams, Pennsylvania, Dam design, Flow control, Environmental effects, Biota, Reservoirs, Rivers.
Identifiers: *Environmental impact statements, *Keysville(Md), Monocracy River(Md).

The proposed project is designed to enhance water supply, stream quality, and recreation opportunities. A concrete gravity dam with earth wings will be constructed on the Monocacy River, two miles due west of Keysville, Maryland. The recreation pool of the lake, at an elevation of 375 feet above mean sea level, will have an area of 3500 acres. A total of 10,880 acres of land will be acquired, including 2,380 acres for the replacement of wildlife habitat. The project will increase the dependable flow of the Monocacy River by 85 million gallons per day, provide adequate flow to meet the maximum day water supply needs of the area, projected for the year 2020, and support an ultimate recreation of 625,000 visitor-days annually. Adverse environmental effects include inundation of 3,500 acres of land, eliminating habitat for all associated terrestrial biota and certain stream dwelling aquatic organisms and damage to historic and archaeological sites within the project area. Alternatives to the proposed project include additional dam and reservoir projects, withdrawals of water from the Potomac Estuary, and importation of water from other river basins. (Gagliardi-Florida)
W75-08015

TROUT RUN EARTHFILL DAM, BOROUGH OF BOYERTOWN, BERKS COUNTY, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Delaware River Basin Commission, Trenton, N.J.
Available from National Technical Information Service, Springfield, Va 22161 as USDC, EIS-PA-73-1176-F, $5.25 in paper copy, $2.25 in microfiche. July 1973. 117 p, 17 tab, 8 fig, 8 ref.

Descriptors: *Delaware River Basin Commission, *Earth dams, *Ecosystems, *Water management(Applied), Environmental effects, Habitats, Wildlife habitats, Wildlife, Impoundments, Water supply, Water demand, Reservoirs, Project planning, Project benefits, Water resources development, *Pennsylvania.
Identifiers: *Environmental impact statements, *Berks County(Pa).

Construction of an earth-fill dam on Trout Run, a tributary to Manatawney Creek entering the Schuylkill River in the Southeastern section of Berks County, Pennsylvania, will generate the new water supply required for this area because of a projected population increase and the presently diminishing reservoir supply. Relocation of about 1 mile of highway LR 06053 will be required in the creation of this 42 acre, 330 million gallon water supply reservoir. Ecological impact of the work will be neutral, since the loss of habitat to existing terrestrial species will be balanced by the concomitant gain to aquatic and wetland wildlife. Cost is estimated at $1,010,000 over 600 days of construction. Suggested alternatives to the proposed project included no action, expansion of the existing source, an impoundment on Ironstone Creek, alternative sites on Trout Run, a diversion dam on Trout Run, importation of water supply and use of ground water. These were found either untenable or less satisfactory than the Trout Run Dam planned. (Ostapoff-Florida)
W75-08030

VERONA DAM AND LAKE, VIRGINIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Baltimore, Md.
Available from National Technical Information Service, Springfield, Va 22161 as EIS-VA-73-1932-F, $6.25 in paper copy, $ 2.25 in microfiche. December 12, 1973. 167 p, 3 fig, 1 plate, 20 tab.

Descriptors: *Dams, *Water supply, *Water supply development, *Stream improvement, Rivers, Environmental effects, *Virginia, Lakes, Recreation, Concrete dams, Damsites, Estuaries, Fishing, Reservoirs, Headwaters.
Identifiers: *Environmental impact statements, Staunton(Va), Verona(Va).

The action involves the reformulation of the proposed Verona Dam and Lake, Virginia, for water supply, stream enhancement, and recreation. The concrete gravity dam with earth wing will be located on Middle River, a tributary to South Fork Shenandoah River, about 9 miles northeast of Staunton, Virginia. The project will increase the dependable flow in Middle River by approximately 110 million gallons per day, a flow sufficient to meet the water supply needs of the Verona-Staunton area through the year 2000, and to provide for the environmental enhancement of the stream from the damsite through the Shenandoah and Potomac River Basin to the Potomac Estuary. The 3,900 acre lake formed by the project will support an ultimate recreation visitation of 700,000 user-days annually and an estimated 98,400 fisherman-days of lake related fishing opportunity. Adverse environmental effects include elimination of about 12 miles of free-flowing streams in the project area, along with an estimated 10,900 fisherman-days of stream fishing use and 12,000 user days of stream-related recreation use. Additionally, approximately 7,850 acres of farm-game habitat will be foregone and an estimated 1,170 hunter days of existing hunting use in the project area will be eliminated. The following alternative water supply concepts were considered: use of new reservoirs; use of hardwater reservoirs; withdrawal of water from the Potomac Estuary; importation of water; development of ground water; use of existing reservoirs; institution of water use restrictions; and no action. (Gagliardi-Florida)
W75-08056

8I. Fisheries Engineering

APPARATUS FOR SUCKING UP AND TRANSFERRING FISHES,
Kyoei Zoki Kabushiki Kaisha, Naruto (Japan) (assignee).
T. Hayashi.
U. S. Patent No 3,871,332, 11 p, 20 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 932, No 3, p 866, March 18, 1975.

Descriptors: *Patents, *Fish handling facilities, Equipment, Conveyance structures, Fish populations, Industry.
Identifiers: *Fisheries engineering, Fish transfer.

An apparatus is described for sucking up fishes caught by a fishing net at a fishing ground or fishes bred in a fish breeding farm into a tank and then transferring the fishes to a given place such as a fish tank. The apparatus comprises a hermetically closed tank that has an air opening at its upper portion, and a fish water suction opening at its lower part. There is a special control device for alternately changing the air extracting and air supplying means. A control valve is arranged for communication the fish water suction pipe with the closed tank and closing the fish transfer pipe during the air extracting step and closing the fish water suction pipe and communicating the fish transfer pipe with the closed tank during the air supplying step. (Sinha-OEIS)
W75-07965

FISH POPULATION INVESTIGATIONS,
Wisconsin Dept. of Natural Resources, Madison.
T. L. Wirth, and J. W. Mason.
In: IES Report 28, Environmental Analysis of the Kickapoo River Impoundment, p 125-128. 1 fig, 2 tab, 3 ref. DACW 37-C-0130.

Descriptors: *Cold-water fishing, *Reservoirs, *Fish populations, Wisconsin, Trout, Rough fish, Forage fish, Tributaries, Dissolved oxygen, Fish barriers, Dams, Aeration.
Identifiers: *Kickapoo River(Wis), *La Farge Lake(Wis).

Fish populations were sampled by electro-fishing in three reaches of the Wisconsin Kickapoo River and seven sections of the tributary streams flowing into the Kickapoo below La Farge. Below the La Farge dam site, the game fish population was very sparse and rough and forage fish predominated. The increased number of carp in the summer suggested a large scale seasonal movement. Trout were found in five of the streams; some natural reproduction occurred. Thirty-five different species of rough and forage fish but no endangered species were found in these waters, with white suckers the most common, then creek chub, hog sucker, bluntnose minnow, blacknose dace, common shiner, and Johnny and fantail darters. The La Farge Dam should benefit the fishery downstream. Siltation could occur behind the old power dam, carp may be attracted to the dam in spring and summer, and dissolved oxygen problems may occur. The Kickapoo River should be managed as trout water, existing fish populations eradicated, a fish barrier built to prevent rough fish reinvasion, the old power dam near La Farge removed, and the hypolimnion of the lake aerated to reduce the biochemical oxygen demand and increase dissolved oxygen in the downstream reach. (See also W75-08158) (Buchanan-Davidson--Wisconsin)
W75-08163

AN INVESTIGATION INTO THE STATUS OF INTRODUCED TROUT (SALMO SPP.) IN WESTERN AUSTRALIA,
Western Australia Dept. of Fisheries and Fauna, Perth.
N. M. Morrissy.
West Aust Dep Fish Fauna Rep. 10. p 1-45, 1971 (1972), Illus.

Descriptors: *Trout, *Australia, *Fish food organisms, Fish diets, Spawning.

Most of the apparently large number and lengths of water-courses in the south-west are unsuitable for trout. Many of the streams where the fish occur must be classed as marginal for trout due to summer conditions. Distribution of trout over the south-west area and within each stream system is restricted by the amount of water and water temperatures in summer. Spawning gravel is not plentiful in the streams. The best streams sampled had weights of fish per acre which were in the lower range of values for waters elsewhere. These values were largely due to the presence of large (takeable) fish since growth rates are comparatively high. The densities of fish (numbers/mile) were relatively low. The streams support abundant populations of crustaceans (marron, gilgies, shrimps and amphipods) and small native fish, but the usual types of aquatic insects found in trout streams are not so prevalent. The best growth rates of trout in Australia and elsewhere are attained by trout on diets of crustaceans and small fish, and not small insects. Trout acclimatization in Western Australia can be judged as generally unsuccessful if the criterion which is used is the number of fish captured per unit of fishing effort. However, the excellent average size of fish which are captured appears to adequately compensate anglers for the sparsity of fish.--Copyright 1973, Biological Abstracts, Inc.
W75-08211

STUDIES ON THE EFFECTIVE STOCKING OF SALMONID FISH: II. ACTIVITY OF DOWN MIGRATION OF HIMEMASU, ONCORHYNCHUS NERKA, SOON AFTER STOCKING WITH SPECIAL REFERENCE TO THE FACTORS OF THEIR MIGRATION, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 2H.
W75-08237

APPLICATION OF IMPORTED PERU FISH MEAL IN FISH FEED: I. FEEDING EXPERIMENT WITH RAINBOW TROUT, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo(Japan).
M. Nomura, T. Nose, Z. Uematsu, and D. Inaba.
Bull Freshwater Fish Res Lab, Vol 22, No 1 p 85-92, 1972. English summary.

Descriptors: *Fish diets, *Rainbow trout, Lipids.
Identifiers: Fish, Growth rates, Protein, Weight, Japan, *Peru fish meal.

In Japan, Peru meal is rarely used as fish feed because of its low quality compared with white fish meal. The increasing demand for white fish meal in fish feed, however, made it necessary to reconsider the possible use of Peru meal. A 15 wk feeding experiment was conducted using rainbow trout of about 45 g at a water temperature of 10C. Four kinds of fish meal were used: untreated Peru meal (Lot V), n-hexane defatted Peru meal (Lot II), methanol-chloroform defatted Peru meal which was previously treated with n-hexane (Lot I) and n-hexane defatted white fish meal (Lot II and IV). In lot III, methanol-chloroform extract from n-hexane defatted Peru meal was added in varied quantities. During the experiment, no mortality was observed. The lots reared on white fish meal were best in growth and feed efficiency. The

fish of lot V, fed untreated Peru meal, resulted in the lowest growth and feeding efficiency. Though the solvents used for the extraction of lipids from the meal were different in Lot I and II, the fish in both lots showed about the same growth and feed efficiency. These values were intermediate between those of white meal and untreated Peru meal. Digestibility of the protein of each diet was measured twice during the experimental period. In both cases, the white fish meal showed the highest value and the untreated Peru meal the lowest. The treatment of Peru meal with solvent increased the digestibility about 4% in both lot I and II. A significant correlation was noted within the 5 lots between digestibility of protein and final body weight. Although Peru meals has some negative factors such as low digestibility and low feed efficiency for the growth of rainbow trout, the meal could be used for fish feed after appropriate.--Copyright 1973, Biological Abstracts, Inc.
W75-08238

STUDIES ON THE CARP CULTURE IN RUNNING WATER POND: VI. MORPHOMETRICAL COMPARISON OF THE COMMON CARP CULTURED IN RUNNING WATER POND, IRRIGATION POND AND FLOATING CAGE, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
K. Chiba.
Bull Freshwater Fish Res Lab, Vol 22, No 1, p 25-38, 1972, Illus. English summary.

Descriptors: *Carp, Farm ponds, *Fish farming.
Identifiers: Japan.

The morphological differences between common carp cultured in running and standing water culture ponds are clarified. Carp cultured in running water were sampled from 2 ponds of T Fish Farm in Gumma prefecture (Japan). Fish cultured in stagnant water conditions were collected from an irrigation pond and a floating culture cage in Lake Suwa in Nagano Prefecture. Analysis by covariance tests of various biometrical characters in these 6 ponds and chemical analysis of carp muscle in all but the floating cage were studied. When compared with carp cultured in the irrigation pond samples from running water ponds were larger in each of the following: body height, body height at the anal position, height of the peduncle, body width, snout-anal fin length, pectoral fin-anal fin length, the weights of body, viscera, visceral adispose tissue and hepatopancreas, and the condition factor. Specimens from the floating cage were similar to those of M Fish Farm in almost all body characters measured. Chemical analysis showed that fat content in the muscle of running water carp was much higher than that of the irrigation pond. Characteristics of carp in running pond water were: larger body height and body width, larger condition factor and heavier viscera and visceral adispose tissue. In some specimens from T-1 visceral adispose tissue was 10% of body weight. The heavy storage of adipose tissues in the viscera seems to be caused by over-feeding of silkworm pupae. Morphometrical differences observed among the carp from 6 ponds is dependent on practices of feeding, especially the amount and composition of diets.--Copyright 1973, Biological Abstracts, Inc.
W75-08240

VARIABILITY OF JUVENILE GRASS CARP CTENOPHARYNGODON IDELLA (VAL.) AND CARP (CYPRINUS CARPIO L. RAISED AT A SOUTH UKRAINIAN FISH HATCHERY, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. of Evolutionary Morphology and Animal Ecology.
D. T. Lekhoa.
Vopr Ikhtiol, Vol 13, No 2, p 367-371, 1973, Illus.

Descriptors: Fish, *Carp, Freshwater fish, *Juvenile fish, *Juvenile growth stages, *Fish management, *Fish hatcheries, Spawning.
Identifiers: Ctenopharyngodon-Idella, *Grass carp, USSR(Ukraine).

The larvae and fry (less than 1 yr old) of the grass carp C. idella and carp C. carpio were raised in experimental and rearing ponds in the Kherson region of the Ukraine, USSR in the summer of 1970. The average water temperature in May was 19.2C, in June 23.5, in July 25.3, and in the 1st half of Aug. 25.2. Owing to unfavorable meteorological conditions and food shortage the juvenile grass carp grew poorly. The maximum retardation of growth was in mid-summer. The juvenile carp, obtained from naturally spawned eggs and fed in a rearing pond on silkworm pupae, reached 17.2 g in 2.5 mo. Retardation of growth was observed between late June and mid-July. The juvenile carp obtained from artifically incubated eggs and reared in a small experimental pond on the same natural food reached a weight of 10.2 g during the same period. With the lack of food, the growth rate of the juveniles decreased steadily, reaching a minimum at the end of summer. Despite this, the juveniles were quite fit and were not inferior to the juveniles obtained from natural spawning with respect to condition and relative length of the intestine. Retardation of the juvenile fishes was accompanied by an increased variability of size and weight and increased positive skewness of the distribution by size-weight classes. The variability indices, especially the skewness coefficient, can serve as a reliable criterion for evaluating the living and biological conditions of juvenile fishes in spawning and rearing ponds. During a period of deterioration of living conditions and retardation of growth, the relative length of the intestine of the juvenile grass carp and carp can decrease considerably.--Copyright 1974, Biological Abstracts, Inc.
W75-08249

BIOLOGY AND MANAGEMENT OF SMALLMOUTH BASS IN ONEIDA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 2H.
W75-08250

CHARACTERISTICS OF A SMALL-LAKE FISHERY AS DETERMINED BY A CREEL CENSUS,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
For primary bibliographic entry see Field 2H.
W75-08251

OPTIMUM LEVEL OF PROTEIN IN PURIFIED DIET FOR EEL, ANGUILLA JAPONICA,
Freshwater Fish Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 2I.
W75-08270

THE CONTENT OF AMINO ACIDS IN THE PROTEINS OF LOWER AQUATIC ANIMALS AND ITS SIGNIFICANCE FOR FISH NUTRITION,
Institut fuer Binnenfischerei, Berlin (East Germany).
M. L. Albrecht, and J. Wuensche.
Arch Tierernaehr, Vol 22, No 6, p 423-430, 1972.

Descriptors: Fish, *Aquatic animals, *Chemical analysis, *Proteins, Carp, Trout, Fish diets, Feeds, *Animal growth, *Growth rates.
Identifiers: *Amino acids, Cystine, Methionine, Oncorhynchus-tshawytscha.

The essential amino acid content in the proteins of lower aquatic animals (28 spp. or genera) was determined microbiologically. The methionine content of these proteins reaches only about 62% of that of fish while the average cystine content is twice as high. Calculations of the amino acid content of 2 populations of fish (carp and trout) revealed that the 2 populations were comparatively well-balanced with regard to crude protein although there were great differences in species composition. The qualitative requirements of fish for amino acids are largely equivalent to those of higher vertebrates. Quantitative data were obtained only for salmon (Oncorhynchus tshawytscha). Poor growth in salmon is due to unfavorable ecological factors rather than poor feed quality.--Copyright 1974, Biological Abstracts, Inc.
W75-08311

RESEARCH ON A POPULATION MODEL OF SOCKEYE ONCORHYNCHUS NERKA (WALB.) UNDER CONDITIONS OF VARIABLE FOOD SUPPLY, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evolyutsionoi Fiziologii i Biokhimii.
V. V. Sukhanov.
Vopr Ikhtiol, Vol 13, No 4, p 626-632, 1973, Illus.

Descriptors: *Animal growth, *Growth, *Fish management, *Mathematical models, Populations, Fish populations, *Sockeye salmon, Environmental effects, *Analytical techniques.
Identifiers: Oncorhynchus-nerka.

The effect of a fishery, nutritive conditions and variability of the environment on population dynamics and growth pattern of Oncorhynchus nerka (Walb.) was studied with the aid of a mathematical model. The algorithm ALGOL-60 was employed on a BESM-3M electronic calculating machine. The applicability of the Ricker 'stock recruitment' curve for approximation of empirical and model data is considered.--Copyright 1974, Biological Abstracts, Inc.
W75-08312

THE GROWTH AND CHEMICAL COMPOSITION OF THE BODY OF THE JUVENILE CARP CYPRINUS CARPIO L. IN RELATION TO THE QUALITY OF PARENTS AND TEMPERATURE CONDITIONS IN NURSERY PONDS, (IN RUSSIAN),
Sibirskii Nauchno-Issledovatelskii Institut Zhivotnovodstva, Novosibirsk (USSR).
V. A. Korovin, and N. P. Mitskevich.
Vopr Ikhtiol, Vol 13, No 4, p 655-661, 1973, Illus.

Descriptors: *Carp, Juveniles, Fish, Growth, Fish reproduction, Life cycles, Growth stages, Fish management, Fish hatcheries.
Identifiers: Cyprinus-carpio.

The effect of water temperature and the quality of derivation on the growth and fattening of young carp was studied. A combination of paratypic and genotypic factors had maximal influence on growth time, while young from the best quality parents under the best conditions have an advantage in growth over young of the same age derived from parents rated lower with respect to a complex of indices. The chemical composition of the body of newly hatched fish and yearlings is entirely determined by the quality of the parents. The process of accumulation of fat during the 1st yr occurs evenly. Loss of weight and reserve fat in the wintering period in superior young occurs less intensely than in contemporaries of the 1st and 2nd class. The necessity for selective breeding is indicated.--Copyright 1974, Biological Abstracts, Inc.
W75-08313

MATERIAL ON THE MATURATION AND FECUNDITY OF FISH (GENUS SALVELINUS) FROM LAKES IMANDRA AND UMBOZERO (IN RUSSIAN),
Polyarnyi Nauchno-Issledovatelskii i Proektnyi Institut Morskogo Rybnogo Khozyaistva i Okeanografii, Murmansk (USSR).
A. I. Kolyushev.
Vopr Ikhtiol, Vol 13, No 4, p 633-646, 1973, Illus.

Descriptors: Fish, Lakes, Fish populations, *Fish management, *Fish reproduction.
Identifiers: Eubotrium-crassum, Salvelinus, Salvelinus-alpinus, Salvelinus-fontinalis, Salvelinus-leppechini, Salvelinus-malma, *USSR(Lake Imandra), *USSR(Lake Umbozero).

Maturation of the sex glands and fertility were studied in the following species of fish from Lakes Imandra and Umbozero: Salvelinus alpinus, S. leppechini, S. fontinalis, Eubotrium crassum, S. malma (Walb.). The specific of the sexual cycle, which determines the size of a population of fish of the genus Salvelinus in reservoirs is considered. Commercial stocks of these fish can be maintained at a relatively high level by rational organization of fisheries and effective artificial breeding.--Copyright 1974, Biological Abstracts, Inc.
W75-08338

THE UTILIZATION OF THE KAYRAKKUM RESERVOIR FOR FISHERIES (IN RUSSIAN),
Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.
V. A. Maksuniv.
Vopr Ikhtiol. Vol 13, No 4, p 618-625, 1973, Illus.

Descriptors: *Fisheries, *Reservoirs, Fish migration, *Fish management, Crustaceans, Mollusks, Reservoirs.
Identifiers: Abramis-brama, Capoetobrama-kuschakewitschi, Chalcalburnus-chalcoides, Ictiobus-cyprinellus, Mysidae, Pelecus-cultratus, Rutilus-rutilus-aralensis, Tadzhik-SSR, *USSR(Kayrakkuma reservoir).

On the basis of size-weight and age composition of catches of the most important commercial fish of the Kayrakkuma water storage basin (Tadzhik SSR, USSR), an analysis of stocks and migration routes is presented. Abramis brama, Pelecus cultratus, Rutilus rutilus aralensis and Capoetobrama kuschakewitschi are emphasized. An increase in fattening of certain species of fish was noted after settling of Mysidae in 1963. The prognosis for reserves over the next 5 yr is given. The primary measures for ensuring the indicated growth of the fish productivity of the reservoir should be: prevention of catching young valuable fish with an enclosed structure; acclimitization in the water storage basin of crustacea (e.g., Cumacea) mollusks (Monodacna, Corbicula, etc.) and fish (Chalcalburnus chalcoides and possibly Ictiobus cyprinellus); selective catching of unprotected species of fish in the shallow upper reaches of the water storage basin; and introduction of new instruments and fishing methods.--Copyright 1974, Biological Abstracts, Inc.
W75-08339

BEHAVIOR OF PERCH FINGERLINGS, PERCA FLUVIATILIS L., OF DIFFERENT ECOLOGICAL GROUPS IN THE PROGENY OF ONE PAIR OF BREEDERS,
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
L. K. Il'ina.
Vopr Ikhtiol, Vol 13, No 2, p 350-361, 1973, Illus.

Descriptors: Ponds, Fish handling facilities, *Fish behavior, *Perch, *Fry.
Identifiers: Perca-fluviatilis, Fish tanks.

Investigations were carried out in small ponds (20 x 40 m) and concrete fish tanks (4 x 4 m) in 1966-1968. One pair of breeders was placed in each tank. After spawning, 2 approximately equal ribbons of eggs were selected, 1 of which was transferred to the pond. Three ecological groups formed in the progeny of a single pair of breeders during rearing of the fingerlings: predators, bottom feeders and plankton feeders. The behavior of the fingerlings of each group during their summer growth are discussed. Remaining in the same body of water, these groups occupied independent ecological niches. This enabled the species to utilize the food resources more fully.--Copyright 1974, Biological Abstracts, Inc.
W75-08341

THE SCOPE OF UTILIZING PADDY FIELDS AS FISH HATCHERIES,
University of Agricultural Sciences, Bangalore (India). Fishery Research Station.
V. Muddanna, K. V. Rajagopal, and H. N. Chandrasekhariah.
Mysore J Agric Sci, Vol 5, No 4, p 447-460, 1971.

Descriptors: Fish management, *Fish hatcheries, Fish reproduction, *Fish-rice rotations, *Rice-fish rotations, *Cultivated lands, Plankton, *Fish farming, Cultures, Phosphates.
Identifiers: Insect larvae, *Paddy fields, Rogor, *Culture media.

The plankton, insect larvae, plant residues and physicochemical factors like dissolved O2, pH and phosphate offered a conducive medium for culture of fish in paddy fields. Rescue pits provided in each of the plots were more useful in giving safe refuge to fish both during reduction of water and at the time of harvest. In spite of spraying pesticides (Rogor 0.1%), a certain percentage of fish survived. Plots not sprayed with pesticide gave better survival than those that were sprayed. Though stocking rate was high (100,000/ha spawn, 50,000/ha fry and 4000/ha fingerlings) the rate of survival, growth of fish and fish production was encouraging. While the rate of fish production ranged from 87,574 to 447,500 kg/ha, the rate of recovery was 6.6-52.5%. There was a slight increase in paddy yield in plots stocked with fish. The wide scope prevalent for paddy-cum-fish culture warrants immediate improvement of cultural techniques to overcome present hurdles like supply of water, damage by pesticides and escape through improper bunds.--Copyright 1973, Biological Abstracts, Inc.
W75-08342

TUBERCULOSIS OF FISH AND OTHER HETEROTHERMIC VERTEBRATES (IN POLISH),
Polskie Towarzystwo Nauk Weterynaryjnych, Warsaw (Poland).
For primary bibliographic entry see Field 5C.
W75-08346

PARASITES OF THE NINE-SPINED STICKLEBACK PUNGITIUS PUNGITIUS (L.),
Nature Conservancy, Abbots Ripton (England). Monks Wood Experimental Station.
For primary bibliographic entry see Field 5C.
W75-08347

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

THE LITERATURE CITED IN THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES PUBLICATIONS ON WATER RELATED SUBJECTS, 1964-1973,
Wisconsin Univ., Madison. Library School.
For primary bibliographic entry see Field 10D.
W75-07996

ORD PUBLICATIONS SUMMARY.
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W75-08014

MAMMALIAN TOXICOLOGY AND TOXICITY TO AQUATIC ORGANISMS OF WHITE PHOSPHORUS AND 'PHOSSY WATER", A WATERBORNE MUNITIONS MANUFACTURING WASTE POLLUTANT - A LITERATURE EVALUATION FINAL COMPREHENSIVE REPORT,
Associated Water and Air Resources Engineers, Inc., Nashville, Tenn.
For primary bibliographic entry see Field 5C.
W75-08305

10D. Specialized Information Center Services

THE LITERATURE CITED IN THE WISCONSIN DEPARTMENT OF NATURAL RESOURCES PUBLICATIONS ON WATER RELATED SUBJECTS, 1964-1973,
Wisconsin Univ., Madison. Library School.
R. D. Walker, and G. J. Zuck.
Available from the National Technical Information Service, Springfield, Va. 22161, as PB-241 981, $4.75 in paper copy, $2.25 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report WIS-WRC-75-03, 1975. 87 p, 6 graphs, 34 tab, 31 ref. OWRT B-083-WIS(1), 14-31-0001-4183.

Descriptors: *Documentation, *Publications, *Information Exchange, *Wisconsin, Water quality, Water supply, Water cycle, Planning.
Identifiers: Technical writing, *Information transfer, Information dissemination.

This study is part of a more comprehensive research study to examine the transfer of information in the area of water resources. It deals with the use of literature cited in the Wisconsin Department of Natural Resources publications on topics of water resources, such as, water quality and quantity, water supply, water cycle, planning, and other water subjects. Citations to the literature in all water related publications issued during the period, 1964-73, are analyzed by subject, age, form, and publisher of cited material. Dispersion of cited journal titles is given and comparative analyzes with other relevant studies are made.
W75-07996

USER-ORIENTED RESEARCH DESIGNS,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 06A.
W75-08206

10F. Preparation Of Reviews

A REVIEW OF THE LITERATURE ON THE USE OF BAYLUSCIDE IN FISHERIES,
National Marine Fisheries Service, Ann Arbor, Mich. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 05C.
W75-08303

A REVIEW OF THE LITERATURE ON THE USE OF ANTIMYCIN IN FISHERIES,
Bureau of Sport Fisheries and Wildlife, LaCrosse, Wis. Fish Control Lab.
For primary bibliographic entry see Field 05C.
W75-08306

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